THE IRON TRADE REVIEW

VOLUME XXV. CLEVELAND, O. DECEMBER 22, 1892. CHICAGO, ILL. NUMBER 51.

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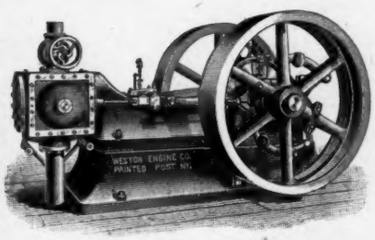

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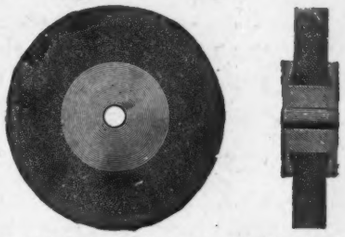

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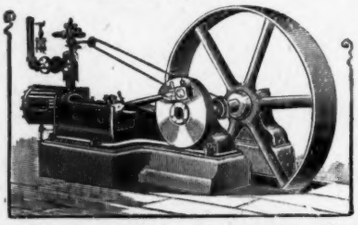

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THE IRON TRADE REVIEW

VOLUME XXV. CLEVELAND, O. DECEMBER 22, 1892. CHICAGO, ILL. NUMBER 51.

THE WEEK IN IRON CIRCLES.

GENERAL FEATURES.

There is no expectation of activity in the raw iron market before the coming in of the new year and market reports meantime will take any color they may have from the expectations of sellers and the signs on which these are based. While the predictions now made for the early months of '93 are not of the distinctly rosy character that marked the forward glances of the trade reviewers, one year ago, the actual conditions now, as statistics show them, are a better basis of hopes than were the December conditions of 1891. The figures given elsewhere show that a weekly blast furnace capacity of 175,921 tons was active Dec. 1, or 1186 tons more than on Nov. 1. This means that the pace of production is only 5,000 tons a month more than the month previous, while stocks of iron decreased about 65,000 tons in November. The New York figures make an increase in weekly capacity of 5,189 tons between Nov. 1 and Dec 1, and two furnaces more in blast, the showing being 246 furnaces and 176,271 tons capacity. The indications are that the make of pig iron for 1892 will come close to 9,140,000 tons, exceeding that of last year by about 860,000 tons, while it will fall below the 9,202,703 tons of 1890, by about 60,000 tons. The shut downs of steel works, rolling mills, and foundries that will come in the next two or three weeks will greatly reduce the amount of iron melted, and there will be no immediate occasion for the blowing in of additional stacks. Furnacemen are disposed to see how the January resumptions affect the temper of pig iron buyers. There is not the temptation to get all available capacity on the active list that was offered by the sanguine predictions of a big year that were everywhere heard before the coming in of '92. The swamping overproduction of last Winter and Spring are fresh enough in mind to beget conservatism. There is everywhere through the market the disposition to make haste slowly and keep both eyes on Washington. The weakening of prices on raw iron and steel would be more significant had it come at another time of the year. Sellers are able, as it is, to charge it all to the season and the statistics will largely bear them out. While there are concessions by smaller concerns, in order to bring buyers into the market, there is little disposition to test the strength of the buying and selling sides. Pittsburg transactions in Bessemer have touched $13.75, and there are buyers who claim that the $13.50 of two months ago will be touched before the decline ceases. Forge iron is weaker, owing to the continued decline of puddling. Billets are beyond the touch of speculators, and $22.25 at mill is a fair statement of the basis of transactions for future deliveries, with $22 available on large lots. In finished lines, there is rather sharp competition for contracts to start up mills that are already shut down and on plates and structural material some close figures are quoted where big contracts are sought. Eastern mills seem particularly desirous of getting orders. There is a fair amount of work in sight, but the advantage is with the buyer. At Chicago, as well as in the East, demand is developing for quite an amount of elevated work.

THE CLEVELAND OUTLOOK.

As the facts about all-rail shipments of ore this year become known, it is evident that, while the total shipments from Lake Superior mines will not reach those of 1890 they will not stop far short. The Chicago & Northwestern alone shows a total of 165,918 gross tons of all-rail originating on its line, up to Dec. 1—96,171 tons from the Marquette range, 69,747 tons from the Menominee range. It is known that the Gogebic shipments by all rail last winter and early spring were in advance of those in the same time in 1891; so that it is not far out of the way to say that all-rail shipments for 1892 will foot up in the neighborhood of 400,000 tons, to be added to the 8,485,210 of water shipments given in our issue of Dec. 1. The past week has developed little among iron ore sales agents. Those of them who have had interviews with buyers of ore find no disposition to talk about contracts for 1893. Some furnacemen are bought up to the middle of the year and show no anxiety as to the trend of prices. Others are disposed to await more definite developments as to the iron ore tariff. While no change that might be made would be likely to go into effect in 1893, the prospect of the removal of the duty on ore would make purchases lighter and shorten the time of deliveries. There is a desire among furnacemen also, to know the results of the tests of Mesaba ores in Pittsburg furnaces. These furnaces are now working on the Mountain Iron ores sent them. At the Isabella furnace, 25 per cent. of Mountain Iron is used, the balance being Norrie and other ores. Cleveland has been the Mecca of Mesaba range investors in the last few weeks, and every few days brings a proposition that will enlist Cleveland mining capital in the development of some new property. It develops that Cleveland ore men whose names have never yet been connected with the Mesaba have an interest there. Shipments from Cleveland to furnaces have been somewhat less, the past week, footing up 32,000 tons, against 38,000 tons the week previous. The Cleveland pig iron market is in a listless state and prices do not change, though buyers could make better terms than were possible a fortnight ago. In finished material there has been the usual run of small orders, with the outlook rather better than a year ago. Structural material is in fair demand. In plates, boiler and bridge work furnishes a large proportion of the call. A transaction of 800 tons in bridge plates and angles was closed in the local market within the week. Old material is very weak. Old iron rails are still sold at $20, delivered.

THE CHICAGO OUTLOOK.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Quite a large business was done in pig iron, the past week, considering the time of year, but no single orders of any size were booked, the sales all being for lots of carloads to 50 and 100 tons. Foundries report a good business generally, with a fair outlook for the future. Some of the smaller dealers continue to make concessions, but in general prices obtained are well up to quotations which are unchanged. Lake Superior charcoal has had a rather small but satisfactory sale, with a bottom price of $17. The inquiry for future delivery continues good, but no sales have been made.

BAR IRON.—Business has been a little quiet, sales made being small. Prices are unchanged at 1.65c to 1.70c.

BILLETS AND RODS.—The market is quiet, no sales of any consequence being reported. Quotations are as last reported—$24.75 to $25 for billets, $33 to $33.50 for rods.

RAILS AND TRACK SUPPLIES.—Business has been rather dull, no sales of any size having been made. Quotations are unchanged. Rails, $31.00 to $32.50; track bolts, 2.75c to 2.80c; spikes, 2.05c to 2.10c.

STRUCTURAL IRON.—The only feature of the situation is in the future business, which promises to be quite large. Several contracts of considerable size will come into the market early in the coming year, and this, with a fair present demand, has tended to strengthen prices of beams a trifle, though no change is made in quotations. Beams and channels, 2.35c to 2.50c; angles, 2.15c to 2.25c; sheared plates, 2.20c to 2.35c; tees, 2.50c.

PLATES, TUBES, ETC.—The demand for tank and boiler plates continues to be especially good, while other grades are selling fairly well. Prices are unchanged. Tank plates, 2.20c to 2.25c; shett steel, 2.35c to 2.40c; flange steel, 2.60c to 2.70c; fire box steel, 3.75c to 4c; tubes are selling at discounts of 55 and 57½ per cent., and 62½ 65 and per cent.

MERCHANT STEEL.—Sales continue to be fairly large with unchanged prices. Open-hearth spring, 2.35c to 2.40; tire, 2c to 2.15c; machinery, 2.20c to 2.25c; crucible spring, 3.60c; machinery, 4.75c; tool steel, 6½c and upwards; Bessemer bars, 1.85c to 1.90c.

SHEETS.—Business is still reported to be quite good, and prices remain as last quoted. Galvanized sheets are selling at 70 and 7½ per cent. and 70 and 5 per cent. at the mills, and 65 and 10 per cent. and 70 per cent. from store. Black sheets are quoted at 3c f. o. b. Chicago.

OLD RAILS, SCRAP, ETC.—The market continues to be dull, almost no business having been done. Quotations remain unchanged. Old rails, $17.50 to $18; old wheels, $14; old steel rails, $12 to $13; No. 1 forge, $14; No. 1 mill, $11; turnings, $8; mixed steel, $9; coil steel, $13.50; leaf steel, $14.50; low tires, $14.50.

GENERAL MARKET RESUME.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Pittsburg. The pig iron market has been rather less active in the past week, owing perhaps to the nearness of the end of the year, when business is usually slack. It is generally thought that there will be some improvement in January. Prices are rather weaker, and neither buyer nor seller is showing any disposition to push matters. Consumers do not claim that anything will be gained by waiting, but they want stocks low for inventories, and the temporary shut-downs will cut off a certain amount of consumption. The easing of prices for Bessemer pig and for billets has given some stimulus to transactions for deliveries in the first quarter of next year. Bessemer iron has been sold at $13.75 and $13.85 in the week, deliveries running to the 1st of April. Billets are about as quoted last week—$22, at mill, on round sales, deliveries winter and early spring. Forge iron shows a slight weakening, offerings increasing while demand is less. The increase in the production of steel since the completion of the new works at New Castle, is somewhat offset by the transfer of the product of the Riverside Iron Works, at Wheeling, from the billet market to the skelp steel market. This refers, of course, to that portion of their product not used n their own tube works. At the meeting of steel sheet manufacturers in this city last week it was reported that while the demand for sheets has fallen off to some extent, the present volume of business is not less than might be looked for at this time of the year, while prices are fairly satisfactory.

Detroit. A little more activity has been experienced in finished material, and some good orders have been placed, but prices are a shade lower than they were a month ago. The pig iron market is without any new features and very little trade except carload lots is in sight. A few inquiries for round lots have been received, but in most cases buyers are only sounding the market, and unless some concessions are made there will not be any very large buying. Prices are unchanged.

Cincinnati. The business of the week has been mainly in small lots. Some fairly good-sized orders have been placed for foundry grades. Large buyers feel indisposed to take hold, unless at concessions which the stronger furnace companies decline to yield. The Northern furnaces are contesting with spirit for supremacy in the markets where the Southern irons have been obtaining a footing, and the contest is an active one, though, happily, void of bitterness. The continued reduction of stocks of coke irons in hands of the furnaces, and the continued large consumption of pig irons, excites wonder upon the part of those making intelligent observations, that any weakness in prices should prevail anywhere. It is a fact that the supply of coke irons unsold is not a fortnight's supply. Were it not that about the holidays brief "closing down," at many of the foundries and mills, curtails consumption somewhat, it would be reasonable to suppose that a very marked scarcity would soon prevail.

Buffalo. The recent activity in buying has given place to the customary December quiet, so that very little new business is being booked. The consumption of iron is going on at a heavy rate, and the activity of foundries at this usually dull season is a healthy indication which promises well.

St. Louis. The present period of dullness in the iron market is expected to last for two or three weeks longer. Quotations remain the same, although special prices have been made in several instances.

Louisville. That general quietness should exist at this season is accepted by both makers and consumers of iron as natural. Manufacturers are all busy, and are not apprehensive of the demand falling off after the first of the year. Furnaces are well sold up for the first three or four months of 1893, and the large producers are not disposed to push sales and be forced to accept lower than ruling prices, when they know there will be a demand for their iron at the proper time. Notwithstanding the short car supply, the condition of stocks shows a large reduction for November, and until the policy of the incoming administration is somewhat more definitely decided there will be no blowing in of additional furnaces. The indications, therefore, are for a gradual reduction of stocks for some time to come.

THE IRON TRADE REVIEW

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TRANSPORTATION, INDUSTRIAL PROGRESS,
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DECEMBER 22, 1892.

COKE MAKING AT SUPERIOR.

I do not have the files of *The Iron Trade Review* before me for reference, but my recollection is that some four or five years since, possibly longer, when the erection of a blast furnace on Lake Superior was first agitated, coke to be made on the ground, I called attention to the well known fact of the rapid deterioration of many bituminous coals, and particularly Connellsville, from weathering. The statement was also made in the same connection, that it would be impossible to carry the Connellsville coal up the Lakes and make even a fair coke out of it. Neither one man's nor one set of men's experience ever amounts to much when it antagonizes something that another man or another set of men have determined to do. So a furnace has been built, and the experiment tried of making coke out of shipped coal. With what success, is shown in your issue of 15th inst. in the verdict in favor of the Lehigh Coal & Iron Co. against the West Duluth Furnace Company. As stated, the coal and iron company set up ovens, carried Connellsville coal to them and made coke, which, according to the furnace company, caused their furnace to chill and ruined their product.

Of course it would do just this thing, but whose fault was it? If the Lehigh Coal & Iron Co. simply agreed to get Connellsville coal and coke it, it did all it promised to do. It would require a miracle to make *good* coke out of weathered Connellsville coal and the days of miracles are said to be past. The unpardonable blunder was on the part of the furnace company in ever making such a contract. An intelligent investigation of the subject would have shown at once the impossibility of making a standard coke out of weathered soft coal, and that any attempt to take Connellsville coal to Lake Superior, stock it, and make a good coke out of it, was doomed in advance to technical and commercial failure.

If coke making at a distance from the mines is to succeed at all, a coal must be secured that will resist weathering. There is reason for believing that there is such a coal, available for lake uses, not quite as pure and good as Connellsville, but good enough to make a sufficiently strong and active coke to carry out the original idea.

There are none so blind as those who won't see. I do not know those who have been in control of the furnace company, but in view of all that has been printed, and said and known as to the effect of weathering, on bituminous coals generally, and of the utter worthlessness of Connellsville coal, even after a short exposure to the air, it was simply unpardonable that any such attempt should have been made, as failure was secured in advance.

EDMUND C. PECHIN.

A QUERY ABOUT RAW MATERIALS.

We are in receipt of the following:

PITTSBURGH, PA., Dec. 16, 1892.

TO THE EDITOR OF THE IRON TRADE REVIEW:

DEAR SIR:—We note your comment upon protection and free raw materials in your issue of November 3rd, concerning the Krupps and the German experiment with protection.

Are we to understand that you favor protection for finished goods and not for iron ore, pig iron, steel billets and similar items called raw material? If so, we shall be pleased to know your reasons for same. If one class of the community is to walk on stilts, why not all? Very truly yours,

H. E. COLLINS & CO.

For Neal Dow to be put to the proof that he is a Prohibitionist or for Henry Watterson to have to make affidavit that he believes in revenue reform, occur to us as somewhat descriptive of the position of *The Iron Trade Review* in being called upon to state its position as to the raw materials tariff. In the sanctums of metropolitan daily journals, whose work has so large an element of celerity in it, the occasional lapse of editor or poof-reader is uniformly due to a frisky feline that haunts the office night and day. But since the luxury of an office cat is denied to weekly journals, their inadvertencies must be boldly confessed. The paragraph to which our friend calls attention was clipped from an Eastern contemporary, who believes in selective protection. In some inscrutable manner the credit got away, and though the item was separated from editorial matter, it seems to have put us under the suspicion of propagating heresy. We want to re-affirm in plainest English *The Iron Trade Review's* firm belief in such a tariff on raw materials as shall protect American capital and labor engaged in producing them. There is no material under discussion by the tariff doctrinaires that is "raw" in the sense of having no labor bestowed upon it. The trees of the forest and the iron ore in the hills are raw materials, but the saw-log and the iron ore of the stock-pile are not. Wherever American labor walks on "stilts," while the foreign laborer in the like employment treads the ground, there is protection's field.

The removal of the duty on iron ore would be a costly blunder. It would cause foreign ore deposits to be vigorously wrought, and would be of some benefit to investors in Cuban mines, who put in their money when there was every expectation that the tariff on iron ore would continue for years, but it would be only harmful to iron mining capital and labor, both North and South. We mistake the temper and interest of Southern iron makers if they do not make known to their Congressmen in unequivocal terms their opposition to the admission of iron ore duty free.

"TWENTY YEARS OF PROGRESS."

Under this title Mr. James M. Swank contributes to the U. S. Geological Survey's report on the mineral resources of the United States in 1891, a comprehensive review of the marvelous development of iron and steel making in this country since 1872. The 32-page pamphlet in which this summation is embraced is just from the press. It is somewhat fresher than the average publication through this government channel, bearing date of Dec. 1, 1892, and containing a reference to the first shipments of ore from the Mesaba.

Beginning at iron ore and running down the line to cut

and wire nails, Mr. Swank gives an outline portrait of the iron industry in the United States with the amazing developments of the last 20 years. It might well be made a companion piece to the industrial section of President Harrison's last message, so pertinent is its testimony to the effect of the tariff policy of the government in the period it covers. We group together a few of the most representative facts it brings out:

From 3,031,891 tons in 1870, iron ore production in the United States went to 16,036,043 tons in 1890, falling to 14,591,178 tons in 1891. This is one of the industries that we are told should not be protected, notwithstanding that under the stimulus of protection the United States passed Great Britain as an iron ore producer in 1890, and is producing nearly all the ore she uses, while Great Britain's record fell from 14,546,105 tons in 1889, to 12,777,689 in 1891.

Michigan, Wisconsin and Minnesota now produce more than one-half of the iron ore mined in the United States.

By the development of Bessemer and open-hearth steel industries, and by the substitution of steel for iron and the economic necessity of using the purest ores for all purposes, there has been a displacement of the inferior ores once in general use in the United States.

The shipment of Southern ores to Indiana, Ohio and other Northern furnaces began in 1872, and ended in 1874. These ores when delivered cost $7.75 to $9.25 a ton, and it took two tons of them to make a ton of pig iron.

From 2,548,713 tons in 1872, pig iron production in the United States rose to 9,202,703 tons in 1890. It was 8,279,870 in 1891, and this year will fall about 60,000 tons short of the big record of '90. Great Britain's climax was reached in her 8,586,680 tons in 1882, and since that time, the decadence has been going steadily on, with slight fluctuations.

In 1890 the United States took the place of Great Britain as the world's greatest producer of pig iron and bids fair to maintain the lead.

In the 20 years from 1872 to 1891, Vermont and Utah have dropped out of the list of pig iron producers. Minnesota entered the list in 1880 and California, Washington Territory and Colorado the next year. The habitat of the pig iron industry of the country has changed little in these 20 years, the author says, if we except the extraordinary record of Alabama. The change in production by fuels is shown as follows:

	1872.	1890.
Anthracite	1,407,058	2,448,781
Coke	946,913	7,154,725
Charcoal	500,587	703,522

Of the 2,448,781 tons set down to anthracite in 1890, only 279,184 tons were made with anthracite alone, the remainder being made with anthracite mixed with coke.

The progress in home pig iron production in these 20 years is attributed to railroad expansion, the increased demand for structural iron and steel and cast iron pipe, the cheapening of pig iron, through improved practice, and the maintenance of protective duties.

The production of Bessemer steel has kept exact pace in the last few years, with the increase of pig iron, there being 3,220,517 tons of Bessemer pig produced in 1887, out of 7,187,206, and in 1890, 4,583,424 tons of Bessemer, out of 10,307,028—45 per cent. of Bessemer in both instances.

From 11,838 tons in 1860, the home production of steel rose to 4,277,071 in 1890, the record for 1891, 3,904,240 tons, being next highest.

Great Britain maintained the lead as a steel producer until 1886, when the United States made 2,562,503 tons against 2,344,670. In 1888 and 1889 Great Britain again led. In 1890 the United States went to the front again, and last year had a product of 3,904,240 tons against 3,256,543 tons for Great Britain.

In the 20 years, our rolling mill industry has trebled production, the aggregate for all mills in 1890, the year of largest production, being 6,745,620 tons, against 1,966,445 in 1873. The comparative records of some of the Southern States do not tally with the general result, however, as this table shows:

	1873	1891
Virginia	12,808	32,754
Georgia	10,624	3,125
Alabama	500	34,022
Tennessee	16,561	10,336
Maryland	58,025	37,618
	98,518	117,855

Tennessee, Maryland and Georgia have lost ground in the amount of rolled iron produced, in the 20 years, while the other States named have made an advance only sufficient to bring the aggregate 20 per cent. beyond what it was in 1873. Assuredly, the need of the South is industries that will work up some of its crude iron into finished forms for consumption in its own bounds.

In his "Twenty Years of Progress in Iron and Steel," just put out by the U. S. Geological Survey in preliminary pamphlet form, Mr. James M. Swank refers to the increase in the weight of rails used by the railroads of the country in that period. Twenty years ago, 60-pound rails were not used more than those weighing 50 or even 45 pounds; more recently 70 and 85 pound rails have been used, the standard section of the Pennsylvania Railroad being an 85-pound rail. The New York Central now has five miles of 100-pound rails and the Pennsylvania has placed an order calling for the same weight. The average weight per yard of all rails made by the Illinois Steel Co. in the last four years—those weighing 50 pounds and upward—has been: 1889, (from May 1) 63.75 pounds; 1890, 66.80 pounds; 1891, 66.95 pounds; 1892 (to Oct. 1) 68.10 pounds.

Everybody who knows anything about the subject, knows that the history of the rail trade for many months has been one of great depression. All of the prophets have been confounded over and over again by the refusal of railroads to place orders for the rails. What it means, and when the depression will end, nobody can tell. Undoubtedly the case is, like most human affairs—complicated. At the same time, the Steel Rail Association refuses to reduce prices, and perhaps the railroads think that they can hold out as long as the rail makers can.—[Railroad Gazette.

And profits, as well as prophets, are "confounded," meanwhile. The last sentence of the above quotation explains the situation. The railroads are waiting for the rail mills to put down the price. There isn't much else to it.

The *Colliery Guardian* does not think that gloom is always to hover over the British iron industry:

There can be no doubt that the general results indicated by the figures which we have been summarizing are of a discouraging character; at the same time action and reaction are an irresistible law of commerce. If deliveries are restricted one day, we hear the next that stocks have become reduced, and this will probably prove true in the future as it has proved true in the past. It is impossible to suppose, also, that railway construction has attained its full development, either in Africa, British India, Australasia, Canada, or other parts of the

world in which our ironmasters have been in the habit of doing business. Sooner or later, then, we shall have to record a change for the better, but for the present British ironmasters are undoubtedly having a trying time of it.

Dixie's Christmas number, with its 120 pages, divided about evenly between its splendid array of special articles and its equally splendid advertising outfit, simply out-Dixie's *Dixie*. Prize essays on the best methods of Southern development are a feature of the issue, and able contributors and bright artists bring together the solid and the beautiful. *Dixie* is true to the industrial South, and keeps pushing.

A New Coke Field.

With the development of the New River coke region in the lower end of this State, now well under way, there will come into the market the most formidable rival the Connellsville region has ever encountered in the field of business rivalry. The announcement was made sometime ago that a syndicate had purchased 100,000 acres of coal lands along the valleys of the New and the Gauley rivers and Loup Creek in Southern West Virginia and would develop them on an immense scale. The work of development was begun by the double tracking of the Chesapeake and Ohio railroad through West Virginia and the building of branches up the Gauley river and Loup creek to tap the seats of manufacture. Soon the wild and picturesquely beautiful regions will be lit up by the glare of innumerable coking furnaces and the blue dome of heaven be obsured by columns upon columns of inky smudge.

The central force of the powerful syndicate undertaking this work will be the Vanderbilt millions and the financial acumen of the big banking house of Drexel, Morgan & Co. The most careful and exhaustive tests were made by experts, and the high quality of the coal for coking purposes, was indubitably proved before the negotiations were set on foot. Now it is merely a question of time until a new, shrewd and powerful competitor will appear on the scene and the certain result will be a lowering of values in the finished iron and steel products. The extensive ramifiations and connections of the Chesapeake & Ohio railroad will put the product of the New River fields into the markets of the South and West upon a most favorable footing and, if the coke comes any where near proving the accuracy of judgment of the experts who have examined it, will well nigh give them a monopoly of all the Southern markets. The force of this competition in the South will be sure to bring lower prices for the coke furnished to the furnaces of Ohio, West Virginia and Pennsylvania and result in somewhat lower values for all sorts of finished material.

Another result certain to ensue, the extent of which is a matter of mere guess work, will be the new uses to which coke will be put. This will be a matter of importance in relieving the glut which so enormous an increase of product would be certain to bring upon the markets were not some new avenues of consumption opened up as well as old ones deepened and made broader.—[Ohio Valley Manufacturer.

A Strike Against Tin Plate Machinery.

An Elwood, Ind., dispatch says: For some time there have been slight differences existing between Welsh workers in the American tin plate factory and the company. On Dec. 17, a conference was held between Manager W. B. Leeds and the men. The result was that the men refused to work unless the company accede to certain conditions. A certain patent machine has been introduced into the tinning department which does away with the work of one man, and the company wants to operate this with an unskilled laborer and pay him less than a skilled laborer commands. The Welshmen demand that skilled labor only shall be employed, as they fear that otherwise unskilled labor will take away their jobs. Until this is conceded they declare they will not work. It is not known just what steps the company purpose taking now, but it is thought some amicable adjustment of the difficulty will be made in a few days.

The Akron Tool Co., of Akron, O., are in receipt of an order from Laughlin & Co., Ltd., of Pittsburg, for a full set of McNeil patent balanced charging barrows to equip their Eliza furnace.

CONDITION OF BLAST FURNACES OF U. S.

December 1, 1892.

[CONDENSED FROM THE AMERICAN MANUFACTURER.]

Location of Furnaces.	Charcoal.					Bituminous or Coke.				
	Total No. of Stacks.	In Blast.		Out of Blast.		Total No. of Stacks.	In Blast.		Out of Blast.	
		Number.	Weekly capacity.	Number.	Weekly capacity.		Number.	Weekly capacity.	Number.	Weekly capacity.
New England	13	7	628	6	498	.....	.....	.....	.....	.....
New York	8	2	263	6	889	6	3	3493	3	2110
Pennsylvania	14	5	343	9	793	5	0	0	5	3616
Pittsburgh	.....	.....	.....	.....	.....	24	21	33578	3	5402
Spiegel	.....	.....	.....	.....	.....	2	2	1617	0	0
Shenango Valley	.....	.....	.....	.....	.....	16	7	7338	9	7491
Jun. and Con. Vals	.....	.....	.....	.....	.....	19	9	8154	10	4160
Maryland	8	3	376	5	354	5	2	2779	3	2952
Virginia	9	1	150	8	496	19	12	6868	7	3822
North Carolina	.....	.....	.....	.....	.....	1	0	0	1	100
West Virginia	.....	.....	.....	.....	.....	4	3	3264	1	260
Ohio—Mahoning Val	.....	.....	.....	.....	.....	13	10	10577	3	3518
East, Cent. & North	.....	.....	.....	.....	.....	17	12	11366	5	4621
Hocking Valley	.....	.....	.....	.....	.....	12	1	577	11	3006
Hanging Rock	.....	.....	.....	.....	.....	13	8	1712	5	1422
Kentucky	3	0	0	3	852	4	3	1413	1	378
Tennessee	6	4	877	2	286	12	7	4150	5	2282
Georgia	4	1	248	3	474	2	0	0	2	1417
Alabama	14	4	1282	10	2021	38	21	15650	17	10011
Indiana	.....	.....	.....	.....	.....	2	0	0	2	325
Illinois	.....	.....	.....	.....	.....	19	9	14545	10	10136
Michigan	22	8	2815	14	3618	.....	.....	.....	.....	.....
Wisconsin	4	2	1193	2	488	4	4	3157	0	0
Minnesota	.....	.....	.....	.....	.....	1	0	0	1	744
Missouri	2	2	655	0	0	5	1	796	4	3330
Texas	4	0	0	4	1075	.....	.....	.....	.....	.....
Oregon	1	1	267	0	0	.....	.....	.....	.....	.....
Colorado	.....	.....	.....	.....	.....	3	2	1103	1	501
Total char. and coke	117	45	9097	72	11823	246	137	132137	109	71604
Total anthracite	152	73	33877	79	28705	.....	.....	.....	.....	.....

SUMMARY.

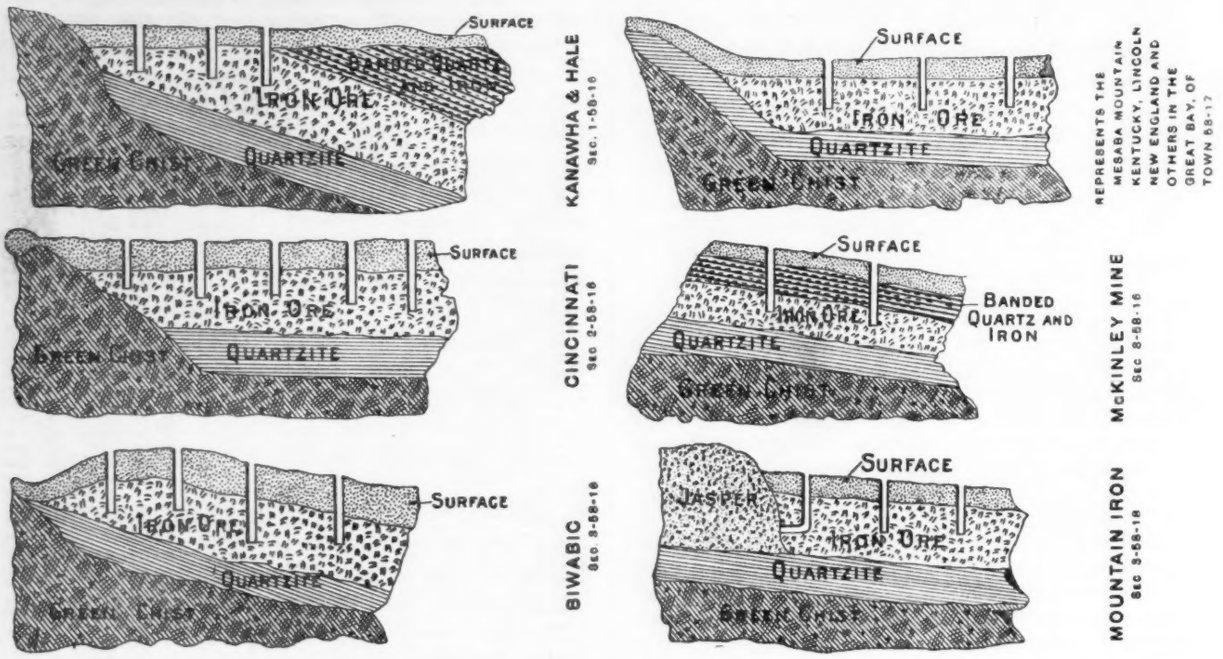
Fuel.	In Blast.						Out of Blast.			
	Number.			Weekly Capacity.			Number.		Weekly Capacity.	
		Month Previous.	Year Previous.		Month Previous.	Year Previous.		Month Previous.		Month Previous.
Charcoal	45	45	59	9,097	10,031	12,753	72	79	11,823	12,287
Anthracite	73	74	88	33,877	31,460	35,592	79	78	28,705	27,431
Bituminous	137	139	162	132,137	132,434	144,664	109	109	71,604	71,458
Total	255	258	309	175,111	173,925	193,009	260	266	112,132	111,176

Ohio Manufacturers Organize.

The manufacturing and commercial establishments of Ohio were represented by upwards of 50 business men at a meeting held in Columbus, Dec. 15, to take steps to secure concerted action relative to legislation involving their interests. An all-day session resulted in the formation of the Ohio Association of Productive Industries. Its objects are declared to be the promotion and extension of the trade of Ohio; to distribute information on commercial and economical subjects; to promote equitable principles of trade; to secure concerted action by the members on matters of public interest; to discuss and correct abuses and to use legitimate methods to protect the interest of the membership. Legislation like the Rawlings act, a taxing measure which is regarded as unfair to the manufacturers of Ohio, is to be an especial object of scrutiny by the new association. Steps will probably be taken to secure a change of this law at the coming session of the Legislature. W. T. Perkins, of Cincinnati, was chosen president; W. R. Warner, of Cleveland, and J. F. Oglevie, of Columbus, vice-presidents; E. P. Wilson, of Cincinnati, secretary; M. V. Cox, of Canton, treasurer. An executive committee was created, consisting of one member from each congressional district. In view of the movements that have been actively pushed in a number of States, with the evident purpose of tax law tinkering, the steps thus taken in Ohio are only the part of prudence. There are evidences that manufacturing interests have been marked for hostile legislation not only of national, but of State application. This opposition has had its source chiefly in political designing, but its effects do not seem to cease with the achievement of that for which it was set on foot.

DUQUESNE (Pa.) Steel Works made 26,713 tons of ingots in November.

MODE OF OCCURRENCE OF MESABA ORE.



The above cuts, reproduced from Mr. David T. Adams' (Duluth) map of the Mesaba range, indicate the mode of occurence of iron ore at the various Mesaba properties named. A comparison of the surface thicknesses of sand and gravel will indicate something as to the method of mining to be pursued. The Cincinnati is to be wrought by underground mining, while at the Biwabik stripping has been going on for some time. It will be seen that the surface at the Biwabik is deeper than at the Cincinnati, and it is not unlikely that there will be underground work at the Biwabik, eventually. The question is almost entirely one of economical operation.

CANADA LAKE SUPERIOR ORES.

Mr. Richard A. Parker, of Marquette, Mich., has written interestingly of the Canadian ore fields, tributary to Lake Superior ports, and of the possible effect of their development upon mining operations in Michigan and Minnesota, if the duty on iron ore should be removed. We reproduce the article below:

There are three points now attracting a good deal of attention—Aticokan, Arrow Lake and the vicinity of Gunflint Lake, Canada. Here the Laurentian gneisses have been traced northward to the west end of the lake, across the border and range a little north of east, about half a mile to a mile and a half, north of the lake. On the south side, the Animikie slates hold in more or less isolated areas deposits of hard hematite of good merchantable grade and of a Bessemer quality.

One Paulison, of Minneapolis, has been operating here this fall, and is now sending in machinery for the winter's work. There is probably 5,000 tons of ore on the dump. So far the workings are quite shallow in this, resembling the development at the Mesaba range, of which this section is doubtless a continuation.

The gabbro overflow found both south and north of the lake contains deposits of ore lying horizontal, as though they filled in the troughs caused by the synclinal folds in the erupted gabbro. These ores, however, were doubtless hematites originally, and by the heat have been partly deoxided into magnetites. They usually carry a noticeable percentage of titanium, an element quite common in this district, and which must, of course, be guarded against by any intending purchaser of such lands.

The building of the Port Arthur, Duluth & Western Railway, from Port Arthur southwesterly, and following the foothills of the gneiss range, will open this district and afford opportunities for explorers to examine these lands, that will be apt to bring to light some of the mineral deposits that are now hidden. The road, after leaving Gunflint Lake, turns south, and will, it is expected, next Summer reach Tower, Minn., thus affording shipping facilities for mines along its route, both in the United States, at Two Harbors, and in Canada, at Port Arthur.

Large tracts of land are now being surveyed and purchased from the Dominion by Americans, upon which it is expected iron ore deposits may be found. There are several large areas on the other side of the boundary line that are covered by the iron-bearing series of rocks that are closely allied to those of the Mesaba range. The quartzites are somewhat finer grained and more apt to be bedded there than here The greenstones both compact and conglomeratic abound, while the brecciated jasper seen in Canadian ore fields is identical with that found at Tower, Minn. The logical conclusion to these occurrences is that these fields will be explored and more iron fields opened up.

And for what? In the United States there is more iron ore produced than the country can consume in spite of the increased population and increased consumption of pig iron *per capita*. Should the duty be removed it will be an added incentive to owners of these lands to prospect and develop them, as, if they have iron ore they will want to sell it. The result of this vast overyield of ore will be a general cutting of price, which means that only the largest mines yielding the highest grades of ore can live; that they will make much, if any, profit will be a doubtful question.

I understand that a charcoal furnace is about to be started at Port Arthur, using soft wood charcoal, and for the time being, at least, using the spathic iron ores found north of the town. These they will doubtless roast, as there are sawmills in the vicinity which will yield waste enough to calcine the ore. So far, so good—but what of the fuel supply? There is along the lines of the Canadian Pacific and Port Arthur, Duluth & Western roads, large tracts of soft woods (none other grow so far north) consisting of spruce, jack pine, white birch, poplar and tamarack; while the wood is conveniently close to the furnace, a large fuel charge may be met by its cheapness per bushel, but, as is inevitable, the wood will be getting further and further away, and the cost, therefore, will be augmenting in proportion to the distance it is hauled.

The furnace cannot be one of the largest, for the fuel will not stand the pressure of the burden. None but the largest furnaces to-day can make pig iron at a profit; but right here, while on the horns of this dilemma, steps in the Dominion government to say that to help them along they will give the

manufacturers of iron $2 per ton. This is guaranteed for three years, I believe. This will certainly help them out for that time, and I have no doubt that it will be continued, as those in authority over there see and feel the necessity of encouraging their own industries.

It may not be generally known that during the session of the 1891 Provincial Parliament the royalty on iron ore was fixed at not exceeding 2 per cent. to "be calculated upon the value of the ore at pit's mouth, less the actual cost of labor and explosives for mining and raising the same to the surface, and shall be payable, etc.," so that the royalty is practically removed. And, again, it is provided that "the royalty hereby reserved shall not be imposed or collected upon any ores mined, wrought or taken until after seven years from the date of the patent or lease, thus giving still greater freedom and inducement for citizens to enter upon their lands and explore for mineral.

POWER AT THE EXPOSITION.

One engine of those to be used at the Exposition is already in place, and the rest will be set up as fast as possible. They will all be placed in the span between the western end of Machinery Hall and the eastern end of Machinery Annex, and will occupy a space 1,000 by 100 feet. The boiler house stands to the rear of Machinery Hall, and is built of corrugated iron—800 feet in length by 86 feet in width. The floor of the boiler house is nine feet lower than the floor of Machinery Hall, and a visitors' gallery 20 feet wide extends the whole length of the building. There will be 40 boilers installed, with a combined capacity of 15,000 h. p. They will be all of tubular construction, and will feed into a "header" under the visitors' gallery, which will in turn serve steam to the 44 engines to be used. The motive power for the Fair will show over 20,000 h. p., 3,000 h. p. being used for electrical purposes.

The power to be used in Machinery Hall will be conveyed by means of shafting, of which there will be used over a mile. Outside of the pumps for fountains, all the motive power of the Fair will be confined to Machinery Hall, except a few engines which form integral parts of exhibits in the Mining Building. For fuel crude oil piped from the oil fields of Ohio will be used. This will be stored in 12 tanks, each eight feet in diameter and 25 feet long; sunk below the surface of the earth in the southeast corner of the grounds. The oil will be pumped to the boiler house through a six inch pipe.

All of the engines being donated for use and having to serve also as the exhibits of the various companies furnishing them, the position in which they were to be placed was a hard problem for Chief Sargeant and his assistants. The solution of the difficulty was in the arrangement of the engines in blocks, with wide aisles between. Three of these blocks are given up to the arc light machines, of which there are 100. Besides these there are twelve large dynamos for incandescent lights and 20 power generators. The following is the official list of engines to be installed and their builders:

Builders and style.	Horse-power.
Buell cross compound	480
Armington & Sims simple	500
General Electrical triple expansion	500
Phœnix triple expansion	500
Phœnix tandem compound	250
Phœnix simple	250
E. P. Allis cross compound	500
Woodbury tandem compound	600
Woodbury tandem compound	375
A. L. Ide simple	200
A. L. Ide tandem compound	225
Ball & Wood cross compound	200
Ball & Wood simple	150
Ball & Wood tandem compound	150
Ball & Wood simple	150
Ball & Wood tandem compound	150
E. P. Allis quadruple expansion	2,000
Fraser & Chalmers triple expansion	1,000
McEwen tandem compound	220
Westinghouse-Church-Kerr compound	330
Westinghouse-Church-Kerr compound	330
Westinghouse-Church-Kerr compound	1,000
Buckeye triple expansion	1,000
Atlas compound	1,000
McIntosh-Seymore double tandem compound	1,000
Westinghouse-Church-Kerr compound	1,000
Buckeye cross compound	300
Buckeye simple compound	125
Buckeye simple compound	125
Buckeye simple compound	190
Buckeye tandem compound	150
Russell double tandem compound	506
Russell double tandem compound	216
Lane & Bodley cross compound	300
Lane & Bodley tandem compound	300
Bass cross compound	224
Atlas tandem compound	500
Watertown double tandem compound	250
Skinner simple	150
Skinner simple	150

ON THE EDITORIAL TABLE.

"The A B C of Iron" is the title of an octavo volume of 100 pages, just issued by Chas. W. Sisson, of the firm of Geo. H. Hull & Co., Louisville, Ky. The author explains in the preface that the increasing inquiries as to the nature and properties of iron led to the publication of the work, which is designed for those who would be discouraged by the voluminous and technical works extant, and have not access to the learned discussions in societies and mechanical institutions. Mr. Sisson does not claim originality. He has put in much that is his own and has, besides, been a judicious editor and condenser. There are chapters on iron, pig iron, constituents of iron, numbering of pig iron, grading of iron, how to reduce cost of mixture, steel, physical properties of metals, with valuable statistical matter and condensed history of iron. Mr. Sisson has succeeded well in simplifying and boiling down the essential facts about the king of industries, and his book will no doubt become a familiar piece of furniture in the foundries and other iron concerns of the country. The price is $2.

The Jeffrey Mfg. Co., of Columbus, are now preparing their illustrated catalogue, which will be completed and ready for distribution by Jan. 1, 1893. It will be the most complete catalogue they have published, consisting of 256 pages, and containing illustrations and lists of all the material they manufacture, including their chain belting and engineering specialties, as well as their coal handling and mining machinery. It will be valuable to all users of machinery and a copy can be had on application.

The Cleveland (O.) Twist Drill Co. send us a '93 calendar, with memorandum leaflets attached, giving space for several jogs to the memory, under each day. The heading, in red and blue, calls attention to the Cleveland Twist Drill Co. and its establishment in 1874.

The Magnolia Anti-Friction Metal Co. have sent out a triple felt pen-wiper, that, with the familiar magnolia blossom and the equally well known advertising formula that goes with it, tells of the wide-spread use of this company's anti-friction metal. A line to 74 Cortlandt street, New York, will bring a duplicate of the one that lies before us.

The disposition of the magazine to try an occasional bit of color illustration is seen in the Christmas *Wide Awake*, which uses with good effect Henry Sandham's study in colors for frontispiece and opening page. The whole number has a Christmas flavor, and every story and illustration is on the high scale always maintained by this excellent young people's magazine.

The Garvin Machine Co., who manufacture and deal in a large variety of iron-working machinery, at Laight and Canal streets, New York, have adopted a very sensible and serviceable form of catalogue, binding together in it single page descriptions and illustrations of their various machines. Each page is complete in itself, and the leaves are printed on but one side. The whole is bound together with staples, so that any leaf may be detached if desired. Drills, lathes, shapers, planers, power presses and drill chucks are shown in all sizes, and described in detail.

The Christmas number of *The WholeFamily*, which is No. 3 of the new magazine the Russell Publishing Co., of Boston, recently brought out, is beautifully-covered and well-filled. Its departments, that include something for each member of the family, are carefully edited, and the whole is bright, attractive and wholesome. Ella Wheeler Wilcox contributes the special story of the Christmas number, and there are a number of well illustrated features. The subscription is $1 a year.

A Remarkable Furnace Record.

Blast furnace No. 4 of the Ensley Division of the Tennessee Coal & Iron Co., that has just gone out of blast for repairs has made the remarkable record of 175,266 tons of pig iron, on an average of 105 tons per day, having run 1668 consecutive days or four years and 208 days, of 365 days to the year, without the fire ever being taken out of heat, leaving out of consideration short stoppages for extraordinary causes which caused them to be idle nine days. This furnace was lined throughout with the Union Mining Co.'s celebrated Mount Savage firebrick.

AMONG THE IRON MINES.

Marquette Range:—

Ishpeming *Iron Ore*, in its last issue, published the season shipments of the Marquette mines in the vicinity of Ishpeming and Negaunee. For the Marquette range, as far as mines have been heard from, *Iron Ore* now has a total of 2,612,201 tons, against a total for all mines for 1891, of 2,511,395 tons. Taking in the shipments of other ranges, as already given in these columns, it estimates that the total shipments for Lake Superior mines for 1892 will be something above 8,700,000 tons; but the complete record of all-rail shipments will be necessary to get at the total accurately. The totals for Ishpeming mines are as follows:

	Tons.
Cleveland	310,907
Iron Cliffs	289,395
Lake Angeline	287,517
East New York	40,000
New York	11,220
Lake Superior	371,530
Winthrop	191,576
Marquette	9,555
Total	1,511,700

The gains over 1891 are, for the Cleveland, 89,111 tons; Iron Cliffs, 11,125; Lake Angeline, 45,912; New York, 11,122; Lake Superior, 62,699; Winthrop, 69,534.

The Negaunee mines shipped the amounts noted below:

	Tons.
Buffalo	380,714
Cambria	41,549
Lillie	29,000
Lucy	26,326
Grand Rapids	22,826
Jackson	92,464
Negaunee	85,846
Volunteer	127,130
Platt	2,676
Total	808,531

The Buffalo fell off 99,795 tons; the Lucy 1,357, and the Jackson 515 tons from 1891. The gains are as follows: Cambria, 6,887 tons; Lillie, 9,449; Grand Rapids, 13,464; Negaunee, 21,628; Volunteer, 34,431; Platt, 2,676.

The Pontiac is the name of the new mine on Sec. 12 immediately south of the South Jackson, and one that has every promise of developing as the largest of the so-called Negaunee hematite range. The ore was discovered during the summer, and the work of developing commenced in a small way. A shaft is now down some 40 feet and the existence of a large body of ore established, the trend of which is east and west. Some 500 tons of ore averaging 63 per cent. metallic iron is already in stock—mined during the past month. The discovery is of special importance in that it furnishes another link in the connection between the Negaunee range and the Lake Angeline mines, and, therefore, is in support of the theory of our most experienced mining men that there is a practical continuation of the ore range from the Lake Angeline east via the South Jackson, Milwaukee, Queen, Negaunee, Cambria and Cleveland Hematite to the Barnum at Ishpeming.—[Negaunee Iron Herald.

The second month's operations under the 8-hour system at the Lake Angeline mine shows a gain over the average for the nine months preceding the month of October of this year of 434 pounds of ore per day per man, and of 450 pounds per day per man over the average of the best two months in the nine previous to the inauguration of the trial. The showing is not as good as that made for the first month of the trial, which gave a gain over the best month of the nine previous of 730 pounds per man.

All operations by the New York mine will stop with the opening of the year. The ore is practically exhausted, and machinery and tools will be hoisted and sold.

Mesaba Range:—

Richard A. Parker informs us that he has seen red slate, identical with that of the Gogebic, underlying the black slates of the Mesaba range and in it recognizes the one link that had been missing to make the similarity of the two ranges complete. He thinks another range will be opened south of that now developing.—[Iron Ore.

The stock pile on the Cincinnati taken out by the Standard Ore Co. now amounts to 7,000 tons. Since September 18, when the first bucket was hoisted, from the first hoisting shaft on the range, the company has driven and timbered nearly 1,000 feet of entries and taken out 7,000 tons of ore. The mine is being equipped with four large drums and 100 horse power boilers. Skips are being put into four large working shafts turning out 500 tons each per day. The stock pile analysis shows the following: Iron 63.40; silica, 6.47; manganese, 0.28; alumina, 0.87; lime, 0.42; magnesia, 034; sulphur, 0.021; phosphorus, 0.35.

The decision of the Duluth & Iron Range Railroad Co. to build a line from a point on their road, between Duluth and Two Harbors, straight into the Mesaba district is a wise business move, in view of the extent to which their line from Tower Junction and Ely to Two Harbors is taxed during the shipping season. The proposed line would give them a loop that would permit of handling the traffic that the Mesaba is to furnish, without disturbing the business of the main line.

Menominee Range:—

The Sheridan, located at Iron River, has produced about 50,000 tons of ore this year. There is no truth in the report that the equipment is to be removed to the Mesaba range.

It is expected that several weeks will elapse before unwatering can begin at the Hamilton and Ludington.

The big pump at the Chapin is nearly ready for work. The water has thus far been lifted by the plunger pumps from the east end of the mine. A water level has been driven from that portion of the underground workings to the west end where the new pump is located, and the water of the mine will be directed into this new channel when the new pumping machinery is ready. There will be five feet of ground to blast out to complete the waterway.

Vermilion Range:—

The Duluth & Iron Range ore dock extension plans embody three projects. The first is to extend No. 4 dock 500 feet; the second, to build 500 feet of No. 3, and the third to build complete No. 3 dock. The increase in capacity under the first proposition would be 84 pockets of 180 tons each; in the second, 90 pockets, and the third, 168 pockets. It is probable that No. 4 dock will have 500 feet added and that No. 3 will be built complete 1,000 feet long. This will about double the present capacity of the docks by adding a total of 252 pockets with a capacity of 45,360 tons.—[Duluth Herald.

In General:—

The samples from the first cargo of Sigua, Cuba, iron ore, landed at Philadelphia recently, showed the following results on analysis at Harrisburg: Metallic iron, 65.850; copper, 0.008; sulphur, 0.037; phosphorus, 0.015; alumina, 0.801; lime, 0.260; magnesia, 0.172; silica, 3.530. An analysis by the furnace company receiving this cargo, made from its own samples, showed: Metallic iron, 66.61; phosphorus, 0.010. A portion of the same cargo also went to the Midvale Steel Co., which reports the following as its analysis: Metallic iron, 67.576; phosphorus, 0.014; sulphur 0.026; alumina, 0.709; lime, 0.620; silica, 1.400; magnesia, 0.111. The second cargo of 2,400 tons was brought by the English steamship *Torgorm*, to Philadelphia. Samples taken and analyzed by Andrew S. McCreath, of Harrisburg, showed: Metallic iron, 63.350; phosphorus, 0.014. Other cargoes will follow at regular intervals.

The Thomas Iron Co. has found a valuable vein of iron ore near Zionsville, Pa. The engine and other machinery have been placed and ore is being taken out and placed on the wharf at Zionsville for shipment to the company's Saucon furnaces at Hellertown.

THE Shell Cycle Fittings Co., of Toledo, manufacturers of cycle parts and sundries, will build at once, and expect to be ready to fill orders by Feb. 1. They are in the market for a boiler 16′x60″, an engine of 65 horse-power, bolt and nut machines, blowers, drills, drop presses, dynamo, elevator, emery wheels, files, lathes, gear cutters, pulleys, hangers, shafting, milling machines and portable forges.

A CONTRACT has been entered into between the Iron Cliffs Co. and Messrs. P. H. Carroll and Samuel Redfern of Negaunee, Mich., for the operation of the company's Pioneer furnace. Stack No. 2 will be put in blast about Jan. 1. Forty men will be employed and 50 to 60 tons of pig iron turned out daily. About 7,000 bushels of coal will be consumed each day.

NEW HOISTING AND CONVEYING SYSTEM.

The prodigious development in mining and quarrying industries in the past few years has opened a field for improved machinery for handling these classes of products. There is a large and constantly increasing demand for hoisting and conveying machines which will rapidly and cheaply transport these bulky and heavy substances. Many different systems have been placed upon the market to meet this demand, some working well under certain conditions, while wholly unfit for others.

The transportation of coal and ore demand the rapid loading and unloading of vessels and cars. For this, the usual form of apparatus used is a suspended bucket, hung from a movable carriage running upon an iron or steel truss. At the mines, however, it is often impracticable to erect such a truss, and in place of it a suspended steel cable is used, which will permit of great distances being covered at a comparatively small cost of erection.

The cut on this page represents a hoisting and conveying system patented by Mr. H. R. Palmer, of Cleveland, which is applicable to all forms of hoisting and conveying machines now in use, whether truss or cableway, and may be used either upon an incline or a level. Referring to the detail view, it will be seen that the operations of raising and lowering the load, as well as traversing, are performed by a single cable actuated by a single drum hoisting engine. One end of the flexible, or moving cable, is attached to the load carriage; thence it passes to the hoisting tower, and through a gripping device, by means of which it can be securely held in any position of the load or carriage.

Thence it passes around a fixed sheave in the tower to a suspended tackle block and up to the top of the tower again, thus forming a take-up loop to provide for the slack cable caused by raising the bucket. From the top of the tower, the rope passes around the engine drum, a sufficient number of turns being taken to prevent slip.

From the engine drum it is carried back to the top of the tower, and from there to the further point of suspension, around a sheave and back to the carriage, here passing through a face block tackle for raising and lowering the load.

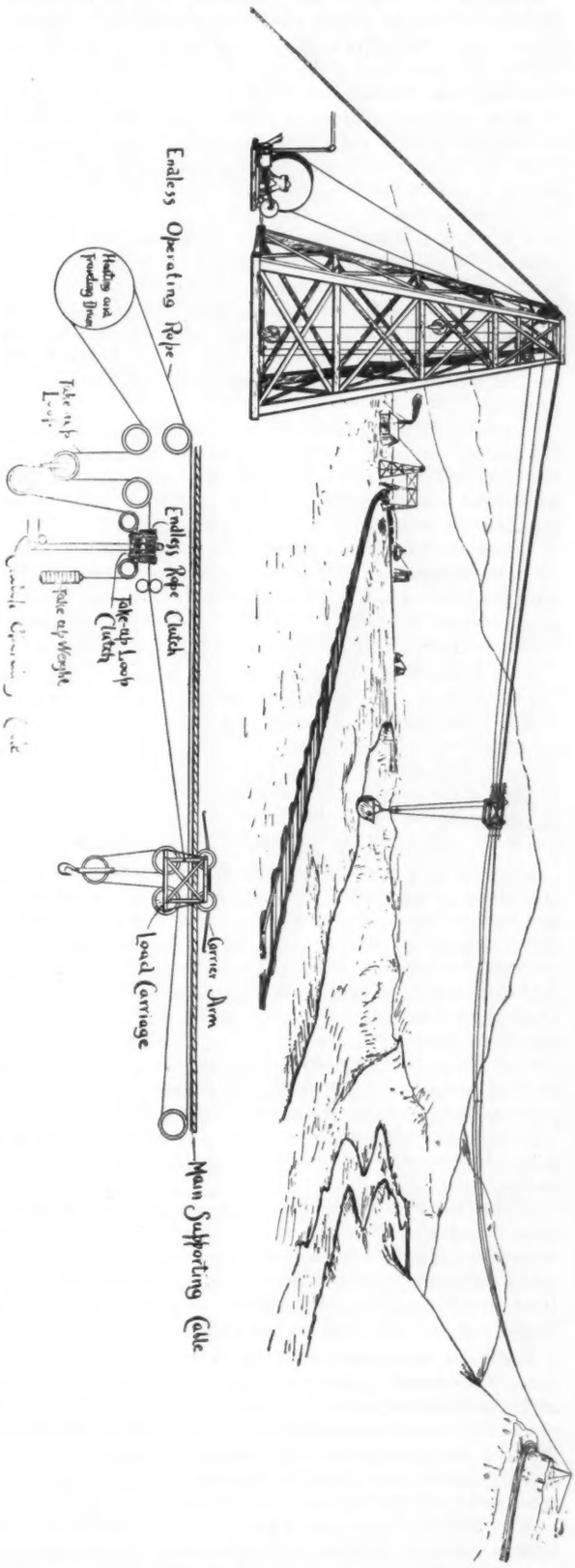
To the tackle block of the take-up loop is fastened an auxiliary cable passing through a sheave at the base of the tower, thence to the top, and through a gripping device similar to the one previously mentioned. Suspended from the end of this cable is a weight approximately equal to the weight of the bucket. This counterbalances the bucket, and effects a saving of power in operation. The grips are operated by small cables, led over sheaves to the engine, and controlled by a lever-stand within reach of the engineer.

The operation of traversing is as follows: The auxiliary cable is gripped, the other being released. The revolution of the engine drum causes the carriage to travel in the direction desired. Reversing the engine reverses the direction of the carriage and load. Assuming the carriage to have reached the point at which it is desired to lower the bucket, the position of the grips are reversed, the auxiliary rope is released and the operating cable fastened. The revolution of the engine drum shortens the take-up loop and raises the counter-weight, paying out the cable on the opposite side, and the bucket descends by its own weight. Reversing the engine reverses the operation, raising the bucket, the counter-weight descending and assisting the engine by gravity. The tension caused by this weight also serves to keep the cable wound tightly upon the engine drum. The operations of traversing and hoisting can be performed at the same instant, thus effecting a saving of time in many instances. By using compound tackle blocks and increasing the weight, any desired drop may be secured for the bucket with a moderately sized tower.

It will be seen that this system requires no automatic catches nor locks upon the carriage, nor bumping blocks upon the track or cableway. It also renders a separate face rope and hoisting drum unnecessary.

The cableways are equipped with carriers to sustain the endless cable, and prevent undue sagging when not under tension. These carriers are entirely automatic in their action and do not require the presence of distributing cables.

This cableway system is particularly adapted to mining operations where there is a convenient water power. A reversible water motor is geared directly to the hoisting drum, which may be situated some distance from the tower, the cable being led over suitable supporting sheaves. Where the water power is situated at a distance too great to render this method practicable, electrical transmission is used, a reversible



electric motor driving the drum in place of the water motor. When the load is to be transported great distances, rendering a single suspension impossible this system permits of a series of suspensions, a modified form of carriage being used in such cases. Thus, a mountain may be crossed, the cableways being led from one side up to the summit, and then to any desired point beyond.

SHOP AND FOUNDRY.

NUMBERING OF IRON.

In his "A B C of Iron," just published, as noted elsewhere, Mr. Chas. W. Sisson gives a valuable chapter on the "Numbering of Iron." He refers to the present method of selling pig iron by the appearance of the fracture and the different classifications of the different districts, and says that the multiplicity of grades and the variations in grading must soon lead to the sale and purchase of pig iron by analysis. The classification which Mr. Sisson regards sufficient for practical purposes, takes in Nos. 1, 2 and 3 foundry, grey forge, and mottled and white iron, under anthracite and coke; Nos. 1, 2, 3 and 5 foundry and Nos. 1, 2, 3, 4, 5, 6 and 7 car wheel, under charcoal. Besides these, he takes account of the soft and silvery irons of the South, and of Ohio silicized irons, containing from 4 to 10 per cent. of silicon, used to soften other irons and to make them run fluid; also of the low phosphorus and sulphur irons used in the open hearth and Bessemer process of steel making and the low silicon and high phosphorus irons used in the basic process.

Carbon in pig iron enables the eye to distinguish the different grades; the softest grayest iron having almost all the carbon in the graphitic or uncombined state, while the hard and white irons have it nearly or wholly combined. The author goes into the details of numbering as follows:

ANTHRACITE AND COKE IRONS.—*No. 1 Foundry* is the darkest of the numbers as well as the softest, as it contains the most graphitic carbon. It is used exclusively in the foundry. In appearance the fracture is dark in color, rough, open grain; tensile strength and elastic limit low; turns soft and tough.

No. 2 Foundry is more generally used in the foundry than any other grade. The grain is not so open and large as No. 1 Foundry, but the iron is harder and stronger, although less tough and more brittle. These two grades, especially No. 1 Foundry, become very liquid when melted, and will run into castings of the frailest and finest structure. The high numbers do not become so liquid when melted as Nos. 1 and 2. Graphitic carbon and silicon are both less in No. 2 than in No. 1.

No. 3 Foundry is used for both mill and foundry purposes. It is much stronger than Nos. 1 and 2, the grain being closer and more compact. It turns hard, is less tough and more brittle than No. 2. The strength for tension seems to reach its limit in this grade. It is less liquid than Nos. 1 and 2 and is, therefore, better adapted to heavy castings. The percentages of graphitic carbon and silicon are smaller and combined carbon larger than in No. 2.

Grey Forge iron is midway between No. 3 Foundry and Mottled, and is used principally in rolling mills. It turns hard and is weaker than No. 3, color lighter and verging into a white background; grain very close. Graphitic carbon and silicon in smaller proportion than in No. 3, and combined carbon in larger.

Mottled: Except in the case of heavy castings requiring great strength and closeness of grain, where it is mixed with other irons, Mottled iron is used exclusively for puddling purposes. Turns with great difficulty, less tough and more brittle than Grey Forge. Graphitic carbon and silicon lower than in Grey Forge and combined carbon higher.

White: It is only when a furnace is working badly that this grade is produced. It has a smooth, white fracture, no grain and is used exclusively in a rolling-mill; tensile strength and elastic limit very low; too hard to turn or drill, as the carbon in this grade is about all in the combined state.

No. 1 Soft, in grain is similar to 1 and 2 Foundry, lighter in color, quite soft and fluid with fair strength.

No. 2 Soft runs between a 2 and 3 Foundry, except that it is light in color and is higher in both graphitic carbon and silicon. These irons, together with silvery irons, which are light in color and high in graphitic carbon and silicon, are used, as the name would indicate, for mixing with stronger and closer grained iron to make them soft and run fluid.

CHARCOAL IRONS.—Foundry irons made from charcoal are considerably stronger, and, because of the fuel, are much freer from impurities than irons made from coke or coal. The grain of charcoal irons of the same numbers as coke runs closer. They are used in foundries where great strength is required in castings.

CAR WHEEL IRONS.—No. 1 is the softest grade, of which very little is used. It will not chill, and is used for ordinary castings.

No. 2 is produced in considerable quantities. It is closer in grain, is generally free from chill, is used for making malleable castings from furnaces and in remelting old wheels for a softener.

No. 3 is a harder iron and chills from one-quarter to three-quarters of an inch; is much used with softer irons in manufacturing car wheels.

No. 4 is a still harder iron and will chill from three-quarters to one and one-quarter inches. This grade is used almost entirely for car wheel purposes.

No. 5 is about half white in the pig, and will chill from one and one-quarter to one and three-quarter inches.

Nos. 6 and 7 are white iron.

Nos. 5, 6 and 7 are mixed with softer irons in car wheel mixtures, and are also used in making chilled rolls.

There does not seem to be any standard governing furnaces, so far as the analysis of the different grades are concerned. This is accounted for by the variations of the constituents in iron ores as well as the character of fuel used, which make it impossible to establish an analysis that would be accepted by all furnaces as a standard.

It would be possible to regulate the graphitic carbon and the silicon, which the grades should contain, but not the other impurities.

We give analyses showing about the average proportions of the elements found in the several grades:

ANALYSES.

	No. 1 Foundry.	No. 2 Foundry.	No. 3 Foundry.	Grey forge.	Mottled.	White.	Soft.	Silvery.
Iron	92.46	93.04	93.93	94.01	93.98	94.64	91.98	90.68
Graphitic Carbon	3.54	3.01	2.50	2.00	1.90	.....	3.65	3.00
Combined Carbon	.14	.28	.75	1.80	1.95	3.65	.05	.06
Silicon	2.80	2.55	1.95	1.00	.91	.40	3.40	5.25
Phosphorus	.75	.70	.30	.65	.50	.25	.50	.75
Sulphur	.01	.02	.02	.02	.02	.10	.02	.01
Manganese	.30	.40	.55	.52	.74	.96	.40	.25

The Lake Superior and other Northern irons having a tendency to red-shortness, and the Southern irons having a tendency to cold-shortness, has resulted in the mixing of the irons from the different sections to very great advantage.

SHOP ROOFS AND FLOORS.

An interesting topic of discussion at the recent meeting of the American Society of Mechanical Engineers, at New York, was the paper of Prof. John E. Sweet, of Syracuse, N. Y., on the weaving shed design for the construction of machine shops. Prof. Sweet pointed out that there were many advantages in this plan, which was that of a one-story structure in sections, separately roofed, with the north sloping side of glass. The common salt-block construction, including a central high section with a gallery on either side, has this disadvantage in a shop so small that one foreman has control of all the machinery—he has to "see saw" across from side to side, worming his way through the erecting section, whereas, with the erecting floor at one side the machine tools are concentrated. With a small shop, too, the climbing up and down stairs is not only a nuisance, but absolutely costly. Things can be moved in an elevator very cheaply, but carting, loading, unloading, and carting again, spoils the economy. It is doubtful if there is any saving in two or more storied shops, except in real estate, and when as much ground has to be left idle to get light as is covered by buildings, then the saving in real estate is small, unless the buildings are more than two stories in hgight.

The advantage of the one-story weaving shed (or "notched") roof plan is that the building can be extended to any length in either direction, or to any width in one direction, without interference with light, with advantage in heating, and with the advantage of having everything on one floor, and that floor a solid one. The section for traveling cranes can be of any hight and width, without interfering with the weaving shed structure or light, by placing it on the south side.

The question of snow, which seems to be the bugbear to

every one first thinking of the weaving-shed roof, is one requiring hardly a second thought. Making the gutter of cast iron of any convenient shape, and putting it inside the building, with the heating pipes adjacent, is all that is required. Keeping the gutters clean is all there is to it, and snow and ice will thaw sooner in cast iron than on the wood planking when the heat comes from the lower side.

The question of shop flooring was also considered in the paper. Prof. Sweet regarded the dirt floors of the French hardly satisfactory; neither are the brick floors of the English. The following plan was followed at the Straight Line Engine Works. The earth was excavated to a depth of 27 inches below the floor line, and rolled with a heavy roller, the soft places filled, and again rolled and leveled. Building stones of the cheapest sort—that is, stone too poor for foundation walls—were dumped on the ground, and men set to sorting the largest pieces and closely packing them on the ground; a strip of 2 or 3 feet of this work was kept in advance of the other filling, so as to insure its solid character. Upon this was a layer of the smaller stone, then broken stone, coarse gravel, fine gravel, and lastly, sand. There is no other possible way in which each grade can be made to retain its place, except by reversing the process and putting the larger above the smaller. If mixed indiscriminately, the fine will work to the bottom and the coarse come to the top. By following the plan given, a solid foundation is secured, upon which is placed nothing but 2-inch hemlock plank running one way, with a 1 inch planed and jointed, but not matched, floor running the other way. The advantage of the thin top is that when there is a hole worn through, it is but one inch deep at the most, and the plain strips of uniform width make it easy to repair. This makes a floor on which anything can be set anywhere, except the largest of the machine tools requiring separate foundations.

In the discussion following, Mr. J. F. Holloway described a floor put down in a western shop. In the ordinary floor construction of ground sleepers with plank above dry rot is quickly engendered. In the particular floor under consideration it was proposed to utilize the principle of wood paving. If the latter would successfully withstand the wear and tear of street traffic it would surely, it was argued, prove a good shop flooring. Accordingly the ground was covered with a layer of sand, and on this were laid one-inch tarred boards. On these again, but at right angles, were laid other one-inch tarred boards, and on top of these, finally, were laid the regular wood paving blocks, treated in the ordinary way with tar filling, etc. This floor, Mr. Holloway stated, fulfilled all the expectations which were entertained of it, proving itself a practically ideal shop floor.

SMOKE PREVENTION IN CHICAGO.

At a dinner given to the officers of the Chicago Society for the Prevention of Smoke, at the Union League Club, Friday evening, Dec. 16, the annual report of the society, prepared by Secretary E. J. Phelps, was read. The Society has been organized since Feb. 1, 1892, and has been actively engaged in its work since April 1. The total expenses up to Nov. 20 have been a little over $11,000, for salaries, legal services, rent, etc. The office force at present consists of the secretary, consulting engineer, four assistant engineers, a stenographer, and solicitor. In his report Mr. Phelps said:

The society began work on the theory that there were a great many people making smoke who would be willing to stop it if they knew how. It has, however, been pretty clearly shown that the majority of persons whose plants create dense smoke are willing to reduce this smoke only when compelled to do so. During the first four months of its existence the society tried educational methods alone, but always with the intention of resorting to legal remedies whenever necessary. Its operations have been confined, practically, to the business center of Chicago.

During the months of March, April, May and June about 600 plants in the business center were visited, and careful investigations were made as to the conditions under which they were working. A detailed report was then sent to the person controlling each plant, stating what, in the judgment of the society, would most cheaply and effectively cause a reduction of smoke. It was found that reports of this character were very little heeded. The society, therefore, determined to adopt an active policy of compulsion, coupled with advice when requested. Since July 1, up to Nov. 1, about 325 suits have been brought by the city, at the instance of the society, as follow Stationary plants, 179; locomotives, 82; tugs, 64. Of the 179 suits against stationary plants, the offender has been fined in 51; 110 suits have been dismissed upon payment of costs; 2 lost; and 16 remain untried. Of the 82 suits against locomotives, the defendant has been fined in 52 cases; 21 cases have been dismissed; 9 remain untried. Of the 64 suits against tugs a fine has been imposed in 52 cases; 12 suits have been dismissed, and none lost.

The result of the work on stationary boilers is as follows: Of the 600 plants to the owners of which expert advice was given, about one-third have adopted some smoke device which has reduced the smoke to a minimum. Of the 179 stationary plants prosecuted about three-quarters have been cured, so that about 300 or 325 nuisances caused by stationary boiler have been abated. In from 100 to 150 other cases the smoke has been lessened two-thirds. About 10 per cent. of the steam-users who have been sued have not materially reduced their smoke nuisance, and continued prosecution seems to be the only method by which to approach this last class.

With regard to the railroads, tests were made last spring of devices for the prevention of smoke from locomotives. May 1 a letter was sent to all the railroads recommending to them certain devices and giving them four months in which to equip all their engines. Most of the railroads took up the subject in earnest. Compared with the figures taken in the same way last March a reduction since then of 75 per cent. of the smoke caused by the locomotive is a conservative estimate.

The result of the suits against tugs has been that 90 per cent. of the nuisance caused by tugs has been removed.

To recapitulate: Between 300 and 325 smoke nuisances in connection with stationary boilers have been removed; the locomotive smoke nuisance within two miles of the business center has been reduced 75 per cent.; the tug nuisance has been reduced between 90 and 95 per cent.

After the reading of the report Mr. Franklin Head discussed the causes of smoke, and spoke of the various devices for its prevention, giving particular attention to the down-draft furnace. "The greatest trouble," he continued, "is that almost every boiler in the territory creating the nuisance is doing double duty. This is one trouble with the Edison company. It has ten boilers when it should have twenty, and it cannot have more on account of a lack of space. The society has been criticised more on account of the Edison company than for any other thing."

In the work of the society some mistakes have been made and some enemies. The work, however, has been done honestly and without fear, and the result has been, upon the whole, very encouraging and the labors of the society will be continued in the knowledge that much the larger portion of the residents of Chicago are favorably inclined towards it. The force of men now engaged in the service has gained experience in the past few months, and it is assured that if money be not lacking, their efforts in the future will be productive of much greater good.

Deaths.

Jno. T. Knight, a well known iron man, died at Easton, Pa., Dec. 15, aged 70. In 1854 he was associated with others in organizing the Thomas Iron Co., now the largest pig iron producing company in this country. He was the treasurer from the commencement of business until October last, when he was elected president to succeed the late Benjamin J. Clark. He was known extensively among iron men.

Henry C. Gould, vice-president of the Gould Car Coupler Co., and a promising young business man, died at Buffalo, Dec. 16.

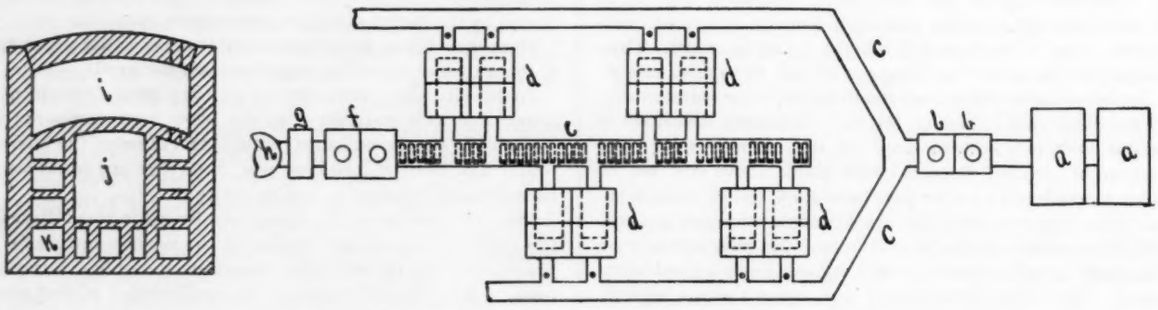
Dr. Werner Siemens, who died in Berlin, Dec. 7, has been confounded in some of the dispatches with his brother Carl Wilhelm, who died in England in 1883. The names of Car Wilhelm and Frederick Siemens will be associated with the open-hearth process of steel making and the regenerative furnace. Dr. Werner Siemens was a pioneer in electrical engineering and was head of the house of Siemens & Halske that s now building an electrical plant at Chicago.

THE Mines and Mining Building, Jackson Park, is nearly completed, and will shortly be closed for the winter.

NEW FURNACE PLANT, WITH GAS SUPPLY.

James H. Welch, of Pittsburg, has designed and patented a furnace plant, in which gas is to be used as a fuel, and in which special reference is had to economy of construction and the saving of fuel. The appended illustrations give an idea of the manner in which manufactured gas is used in the furnaces, instead of coal. In the diagrams *a a* are gas producers; *b b* is an arrangement to improve the gas, *c c* are flues to conduct gas to the furnaces. The latter, *d d*, are puddling, heating, soaking pit, open hearth, or other furnace, *e e* are the conduits, the one inside, leading from the furnaces, conveying all the waste gases or fuel to the stack, the other leading from the stack, taking in air which surrounds the inside waste fuel and takes up the heat, while the air passes on to the furnaces. The furnaces are controlled by gas valve, air and fuel dampers, and are used just as any natural gas furnace is worked. It is a continuous, direct and not reversible furnace. The inventor claims 50 per cent. saving over other direct furnaces and 20 per cent. over any reversible furnace, Siemens or other regenerative system. In reversing, a certain proportion of the fuel is wasted, passing from the checker work to the stack.

The Welch furnace arrangement absorbs all waste fuel or heat by the air surrounding the waste fuel flue and brings the air in the furnace to a higher heat, at less cost than in other systems. At *f* is an arrangement that may be used, if necessary, to enrich the gas before it is used under boilers for generating steam; at *g* are boilers or heaters. The inventor claims that there is perfect smoke consumption, with great labor-saving over the system now in use. If only a few furnaces are working, those out of use have only to close their dampers and lower damper at the end of conduit. *i k j* show how the inside flue is braced inside the air chamber and passages, allowing the air to circulate around the waste fuel flue to the stack.



NEW FURNACE PLANT, WITH GAS SUPPLY.

The general claim set forth on the patent is on a furnace plant comprising a series of hearth-furnaces connected with a general gas supply, an air-duct for each of the said hearth-furnaces and leading to the combustion chamber of the hearth to supply the air necessary for the combustion of the gas, and a waste-gas duct for each hearth-furnace and extending under part of the corresponding air-duct and formed with a channel through which passes the said air-duct and which channel opens into the respective hearth at the discharge side thereof.

Mr. Welch applies the designation recuperative to his furnace because it makes use of what is being lost by working furnaces under the present systems.

JACKSON PARK INDUSTRIAL NOTES.

Chief Robinson, of the Department of Machinery, has secured an unique exhibit for his department. It is, he believes, the smallest working steam engine ever made. The diameter of the cylinder is $\frac{1}{16}$ of an inch, length of stroke $\frac{3}{16}$ of an inch, and diameter of fly wheel $\frac{5}{8}$ of an inch. The engine, boiler, stack, and plate on which the whole rests, weighs less than half an ounce. It was constructed by Cyrus Chambers, Jr. of Philadelphia, when he was but 16 years old.

President Bonney, of the World's Congress Auxiliary, has provided for a congress of inventors, to be held in August, '93, by the appointment of a special committee to make the necessary arrangements. The congress will consider the international patent law, treaty regulations in regard to patents, uniformity of patent laws and trade marks. The congress will be composed of officials in charge of patent and industrial departments of the various governments, patent lawyers, leading inventors and manufacturers.

James. A. Allison, Chief of the Department of Manufactures, has been suffering from an attack of nervous prostration, due to overwork, and has been granted an indefinite leave of absence by Director-General Davis. In the absence of Mr. Allison, his assistant, Mr. Frank Williams, will have charge of the department.

The interior equipment of Machinery Hall is being rapidly pushed by Chief Robinson. Two of the three immense traveling cranes for use in the building are already on the ground. The one sent by the Yale & Towne Co. is erected in the center span of Machinery Hall, and is all ready for use. That furnished by the Morgan Engineering Co. is in process of erection, and the third, furnished by Wm. Sellers & Co., of Philadelphia, is now on the way. These cranes operate by electricity, on a track 1,400 feet long. They each weigh 50 tons, and have a carrying capacity of 20 tons.

The Walker Mfg. Co., of Cleveland, have promised to send fac-similes in wood of the large cable and gear wheels manufactured by them. They will form a special exhibit, and will be placed outside of Machinery Hall.

Wm. Cramp & Sons, of Philadelphia, will furnish a wooden model of one of their large quadruple expansion steam engines, such as are used in the new U. S. cruisers, for exhibit.

A mineral cabin will be built in the Mines Building, by Ohio, to illustrate the mineral resources of that State. It will cover 32x61 feet of space, and will be 23 feet high. It will be constructed entirely of Ohio building material, the principal elements being the mineral products of the State.

A Novel Bridge for Chicago.

In the place of the old S. Halsted street bridge over the Chicago river, which was destroyed in a collision lately, it has been decided to build a new form of bridge, in the style of an elevator. It will consist of a vertical span, 130 feet long, that can be raised vertically to a height that will permit the largest lake vessel to pass beneath. At each side of the river there will be a tower, 200 feet high, which will be constructed of steel, and at the top of which there will be the pulleys over which will pass 32 steel wire cables one and one-half inches in diameter, that will lift the bridge. The towers will be braced at the top by trusses to prevent swaying or giving when lifting the bridge, which it is estimated will weigh 1,140,000 pounds The bridge can be raised to a maximum distance of 155 feet from the water's level, and when lowered will be 14 feet clear of the water, allowing tugs and small craft to pass. There will be an operating house in the center of the bridge, where a device is placed that enables the operator to tell when the bridge is raised high enough for the vessel to pass. This will obviate the necessity of raising the bridge to its full height for a small vessel. The engines for raising the span will be placed under the street at the north end of the bridge, and arrangements will be provided for raising it by hand should the engines become disabled. The structure is provided with brakes in case of accident, and with hydraulic buffers at the tops and bottoms of the towers.

The chief merit of this style of bridge is that no pier is required in the center of the river, and thus a clear passage the width of the river is obtained for vessels.

ESTIMATED home production of pig iron, in 1892, is 9,140,000 tons.

BARNES FRICTION CLUTCH PULLEYS.

The accompanying cuts give detail representations of one of the latest improvements in friction clutch pulleys and cut-off couplings, manufactured by the J. H. & D. Lake Co., of Hornellsville, N. Y. Fig. 1 gives a sectional side view of the Barnes screw lever friction pulley in released position, showing the driving hub keyed to the shaft.

Fig. 2 is a sectional end view describing the friction hub encircled by friction-ring, the former of which is cast in one solid piece with the pulleys. Projecting lugs on opposite sides of the driving hub of the ring drop into lugs, or lug cavities, of the friction ring; and when the clutch is on these lugs

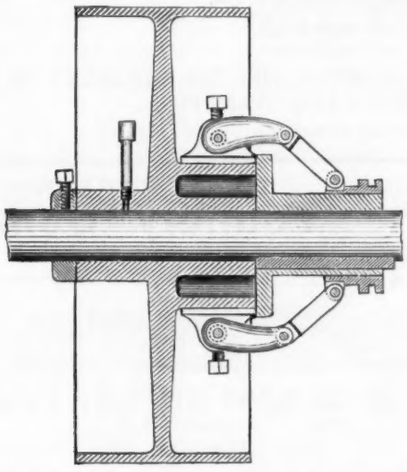


FIG. 1.

take all the driving power. This is an improvement over the old bolt fastening system, the bolts of which are more liable to be affected by the twisting strain upon the hub from the friction of the clutch. At the top and bottom of Fig. 2 is shown a simple device which dispenses with much complicated machinery and is more than a substitute for the corresponding complex parts of some previous inventions. It is a lever nut on each side of the friction-ring, one-half of the nut being cut with a right thread and the other half with a left thread. Sufficient space between opposite sections of the ring is given for contraction or clutch, which is effected by means of right and left thread screw-bolts entering the lever nut from opposite sides, secured by set screws. Duplex levers are attached to

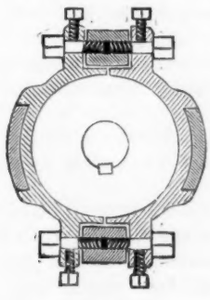


FIG. 2.

these nuts at their upper section and to the hub at their lower section. When the shipper sleeve is thrown against the flange by the operating lever, the duplex lever turns the nut sufficiently to produce a friction that was never known to lose its grip, nor has a thread of these screw-bolts ever been known to break. The screw bolts are adjustable to any desired pressure, however, in case the clutch should ever become lax. They give the pulley a positive grip and absolute release from the hub by each opposite shift of the operating lever, without the use of springs. The Barnes screw lever friction clutch pulleys and cut-off couplings are adapted to both heavy and light work.

AT Burlington, Ia., the McCosh iron and steel works were sold by the sheriff Dec. 15. They were bid in for $75,000 by Starker and Remey, trustees of the banks which held mortgages to the amount of $220,000 against the defunct concern.

INDUSTRIAL SUMMARY.

New Enterprises:—

The following recent incorporations, specially reported for *The Iron Trade Review*, are of interest to the iron and machinery trade:

Chicago, Ill.—Mills Pneumatic Gate Co.; capital, $200,000; to manufacture and sell railroad crossing gates and crossing signal bells; incorporators: F. W. Mills, H. S. Mills, Edward Arnold.

Detroit, Mich.—Tighe Concentrator Mfg. Co.; capital, $25,000; for the manufacture of Tighe concentrators; incorporators: Lewis Tighe, Fred. H. Tighe, Mrs. Letitia Martin, all of eDtroit, Mich.

Philadelphia, Pa.—Norristown Furnace Co.; capital, $50,000; for the manufacture of iron or steel or both, etc.; incorporators; E. R. Mann, Rosemont, Pa.; Frank Samuel, Paul Thompson, Philadelphia, Pa.

Canton, O.—The Novelty Iron Co. (incorporated in W. Va.); capital, $40,000; for carrying on a general iron foundry and machine shop; incorporators: W. E. Sherlock, M. C. Sherlock, C. H. Elmer, all of Canton, O.

Chicago, Ill.—Fairview Manufacturing Co.; capital, $100,000; to manufacture the Preston wood pulley, shaft hangers, shaft couplings and shaft boxes; incorporators: Almon E. Preston, Levi Eberhary, Samuel A. Craig.

Ypsilanti, Mich.—Morgan Alcohol Time Signal Co.; capital, $12,000; for the manufacture and sale of railroad time signals; incorporators: Benjamin B. Morgan, Wm. Guerns, David W. Grommon, E. H. Holmes, Ypsilanti, Mich.

Chicago, Ill.—McEntee Electric Co.; capital, $10,000; for the electrical construction and equipment bnsiness, and to deal in electrical material, appliances and devices; incorporators: Wm. Pettis, Chas. Aldworth, Jas. A. McEntee.

Chicago, Ill.—H. Johansen Mfg. Co.; capital, $50,000; to manufacture patterns and models of wood or metal and general machine work and metal manufacturing; incorporators: H. Johansen, Peter I. Johansen, James Johansen.

Harrisburg, Pa.—South Harrisburg Chain Works; capital, $15,000; to manufacture chain or any other article of commerce from metal or wood or both; incorporators: B. F. Meyers, C. A. Lee, Patrick Russ, all of Harrisburg, Pa.

North Tonawanda, N. Y.—The Boulton Carbon Mfg. Co.; capital, $60,000; for manufacture of carbons, electrical machinery, etc.; incorporators: Wm. H. Boulton, Buffalo, N. Y.; Geo. P. Smith, Augustus J. Hathaway, both of N. Tonawanda, N. Y.

Chicago, Ill.—Great Western Wire Works; capital, $20,000; to manufacture and sell wire goods, brass and iron goods, papier-mache forms, elevator guards, and manufacturers agents for same; incorporators: E. C. Tyler, Wm. D. Barge, Wm. M. Johnson.

Cleveland, O.—The Acme Machinery Co.; capital, $150,000; for manufacturing and dealing in machinery and any and all metals and materials used in manufacture thereof; incorporators: F. W. Bruch, C. Greve, M. D. Luehrs, H. P. Eilers, Frank N. Zwilling.

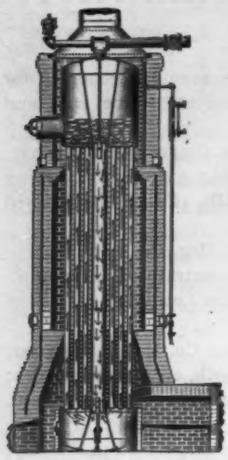
Cincinnati, O.—The Wm. Aufderheide Co.; capital, $25,000; for manufacturing and dealing in carriages, wagons and vehicles of every description, etc.; incorporators: Wilhelm Aufderheide, Edward E. Hughes, A. Aufderheide, Wm. Aufderheide, Jr., Victor von Wyck.

New York, N. Y.—Canda Cattle Car Co.; capital, $800,000; for the manufacture and sale of railway equipment, especially cars for cattle, horses, sheep, hogs, etc.; incorporators: Chas. S. Fairchild, Valentine P. Snyder, both of New York, N. Y.; Jos. L. Caren, Philadelphia, Pa.

Cincinnati, O.—The Queen City Mortar Co.; capital, $100,000; for manufacturing and dealing in mortar of all kinds, mortar making machinery, lime, cement, plaster, sand, hair and building materials; incorporators: Walter H. Field, S. F. Dana, Walter Griffith, L. A. Ault, Ferdinand Jelke, Jr.

New York, N. Y.—Hercules Ejector Co. (incorporated in W. Va.); capital, $1,000,000; for dealing in letters patent relating to ejectors for raising water or other fluids and manufacturing such ejectors, etc.; incorporators: Geo. H. Felt, C. B. Harris, W. F. Osborn, M. R. Robinson, New York, N. Y.

Cleveland, O.—The Cuyahoga Mfg. Co.; capital, $25,000; for making, manufacturing, buying, selling and dealing in any



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MANSFIELD, OHIO, U. S. A.

SOLE BUILDERS OF THE

Cook Patent Water Tube Boiler.

THE ONLY PERFECT WASTE-HEAT BOILER.

No incrustation.
Generates the greatest amount steam with least amount heat.
Repairs reduced to a minimum.
Can be used equally as well for direct firing or with natural gas.

WE ARE ALSO BUILDERS OF

HORIZONTAL, TUBULAR, AND FLUE BOILERS, LOCOMOTIVE, FIRE BOX AND ALL OTHER STYLES OF BOILERS, OIL TANKS AND WATER STAND PIPES.

Estimates furnished promptly on receipt of specifications.

Office, THE ROOKERY, CHICAGO.

South Chicago

A SUBSTITUTE FOR STEEL

IN

Cross Heads, Crank Shafts, Gears, Hammer Dies, Etc.

"McDOWELL'S"

"Semi-Steel"

Works: SOUTH CHICAGO.

Foundry Comp'y.

AN ANTI-ACID METAL

FOR

Acid Pans, Smelting Kettles, Hydraulic and Ammonia Cylinders.

THE GARDEN CITY SAND CO., Room 53, 159 La Salle St., CHICAGO, ILL.

FIRE BRICK, FIRE CLAY,

For Blast Furnaces, Cupola Lining, Boiler Setting, Smoke Stack Lining, or Any Other Purpose.

EVERY CLASS OF SPECIAL SHAPES AND SIZES.

ALL KINDS OF

Foundry Supplies.

FACINGS, BLACKINGS AND MOULDING SANDS

Of All Kinds.

and all such manufactured articles and products as may, from time to time, be determined by the company. [Extension of province of the company, which is now manufacturing locks, door knobs, etc.]; incorporators: J. H. Dempsey, Wm. B. Sanders, W. B. Whiting, Lon M. Snyder, Harrison B. McGraw.

Marion, O.—The Marion Improvement Co.; capital, $10,000; for improving, manufacturing, buying, selling and dealing generally in machinery and articles of manufacture and merchandise; incorporators: Henry Strelitz, John J. Hane, E. G. Allen, John F. McNeal, John A. Wolford, Thomas J. McMurray.

Bradford, Pa.—Bradford Wooden Ware & Enameling Co.; capital, $20,000; for the manufacture and sale of wares from wood and metals and combination thereof, plain and enamelled; incorporators: Adam S. Wyman, Albert B. Booth, Henry W. Ford, Dan'l O. Donnell, Russel J. Straight, all of Bradford, Pa.

Chicago, Ill.—Automatic Railway Signal & Construction Co.; capital, $2,500,000; to own, buy, sell, lease and control certain letters patent for automatic railway devices and to manufacture, construct, sell, lease and operate same, together with appliances and improvements therein; incorporators: Wm. H. Hall, H. S. Kress, Campbell Allison.

Chicago, Ill.—Morse Light, Heat & Power Supply Co.; capital, $1,000,000; to produce, use, transmit and sell light, heat signals and power, and to construct, maintain and operate complete plants for the production, use and transmission of light, heat signals and power; incorporators: Geo. L. Cragg, Louis Spahar, Geo. W. McMahon.

Chicago, Ill.—Commercial Fuel Co.; capital, $100,000; to buy, sell, lease and manufacture stoves, furnaces and all kinds of heating apparatus and devices; acquire mortgage and transfer letters patent of all kinds; contract for and collecting royalties for manufacturing machines and devices under such patents; incorporators: Alfred K. Wells, Geo. B. Allen, Alphonse R. Colgan.

New Buyers in the Market, and Some of Their Wants:—

A foundry is to be built at Shreve, Wayne county, O.

The council of Rockford, Ill., will build a new iron girder bridge across Keith creek in that city.

Spokane, Wash., will receive bids until Dec. 26, for furnishing three pumps of 3,000,000 gallons capacity, one of 4,000,000 gallons capacity and one of 5,000,000 gallons, and boilers and engines for all.

A railroad bridge is to be built across Portage Lake, Mich., next season, says the Sault Ste. Marie *News*.

August Gehner has bought a $11,000 site from the South St. Louis Iron Co., with a view to building a factory.

Stimmel & Hook Mfg. Co., of Turner, Ill., will purchase drills, lathes, foundry supplies and improved moulding machinery.

The county commissioners will receive bids at Wabasha, Minn., until Jan. 5, for a 100-foot iron bridge over the Zumbro river.

The Baker Metal Wheel Co., of Toledo, has secured an option on land at that place and it is expected that building will soon begin.

A new foundry company that is to locate just east of Lebanon, Pa., has placed $20,000 of its stock at Lebanon, and operations will begin soon.

The council of Rochester, N. Y., is considering the construction of a bridge across the Genesee river and the Erie canal. The canal is to be spanned by an iron plate girder bridge.

The Blair Wheel & Axle Co., of Superior, Wis., recently organized with $100,000 capital, will begin building in two or three weeks. They have patents on a new iron wheel and axle.

The Minnesota Nickel-Steel Co., recently incorporated with $100,000 capital, will build a plant at once. The incorporators are John Paulson, Kristian Kortgaard and Robert Enegren, all of Minneapolis.

The Totten & Hogg Iron & Steel Foundry Co., of Pittsburg, are in the market for a 15-ton second hand iron or wooden hand crane. The same firm want to buy a second hand power hammer of from 500 to 800 lbs.

The Cooley & Vater Co., of Minneapolis, manufacturers of engines, boilers and electrical equipment, have incorporated with $50,000 capital. Edwin Cooley is president, F. F. Vater general manager and F. S. Hinkley secretary.

The new Pittsburg & Western shops will be located at the junction of that road with the Pittsburg, Painesville & Fairport, and surveyors are at work on the site. A contract has been let for the erection of 50 dwellings at this point.

The plans for the new bridge over the Chicago river, at

MOUNT SAVAGE FIRE BRICK.

UNION MINING CO.,

Proprietors of the CELEBRATED Mount Savage Fire Brick.

GOVERNMENT ⁜ STANDARD.

Established 1841. Capacity, 60,000 Per Day; 18,000,000 Per Year.

The First Manufactory of its Kind in the U. S.

Home Office and Works:—MOUNT SAVAGE, Alleganv Countv, Md.

Branch Offices:—No. 1 Broadway, New York, N. Y.: No. 222 So. Third St., Philadelphia, Pa.; Lewis Block, Pittsburgh, Pa.

DIAMOND W&B DRILL

THE WHITMAN & BARNES MFG. CO.,

Manufacturers of DIAMOND BRAND TWIST DRILLS.

FACTORIES AT
Akron, O.; Syracuse, N. Y.; Canton, O.; St. Catharines, Ont.

STORES AND WAREHOUSES AT
Boston, Mass.; New York, N. Y.; Philadelphia, Pa.; Cincinnati, O.; Chicago, Ill.; Kansas City, Mo.; San Francisco, Cal.; London, Eng.

Halstead street, Chicago, contemplate a lift bridge that can be lifted into the air like a sash, to a height of 140 feet, or five feet higher than the Brooklyn bridge. The plans on file with the Secretary of War involve a $180,000 outlay.

Josiah Ross, Buffalo, N. Y., manufacturer of woodworking machinery, is putting up a building 222x60 feet, four stories high, with a wing 200x43 feet, containing in all 85,000 square feet floor space, to be let out. It will be supplied with power, and heated and lighted in the best manner.

Proposals will be received at the Supervising Architect's office, Washington, D. C., until 2 P. M., Jan. 17, 1893, for labor and materials to put in place complete the cast iron and Z bar columns, steel and iron floor, ceiling and roof construction, ceiling light, skylight roof, dormers, etc., complete for the U. S. Postoffice building, at Worcester, Mass.

At the office of the Supervising Architect, Treasury Department, Washington, D. C., sealed proposals will be received until 2 P. M., Jan. 17, 1893, for furnishing all the labor and materials and fixing in place complete, the low-pressure, return circulation, steam heating and ventilating apparatus required for the U. S. Court House, Postoffice and Custom House building at Bay City, Mich.

Additions, Enlargements, Removals, Etc.:—

The Howard machine works, Indianapolis, are still enlarging their plant.

The Cahill Iron Co., of Chattanooga, Tenn., are building a two-story machine shop, 40x70 feet.

It is said that the Crystal Falls (Mich.) Iron Works will be removed to some point on the Mesaba range.

The Buck stove and range works, at St. Louis, are being enlarged by the erection of a six-story 200-foot front building.

The Aluminum Alloy Metal Works Co., of Hampton, Ia., is seeking to locate either in Kansas City, Mo., or in Kansas City, Kas. It has $200,000 capital and will erect extensive works.

The Indianapolis bolt and machine works, of O. Olsen, must enlarge speedily, and the ground adjoining is already covered with manufactories. Larger works will probably be built on the belt road.

Corbett & Stadler, who started their new boiler works in Oak Park, Ill., addition a few months ago, will extend their buildings as soon as possible. They have a contract to build 500 upright boilers for a Chicago house, and need double their present capacity.

The Reliance Wire & Iron Works Co., of Milwaukee, which purchased the Beloit, Wis., Architectural Metal Works, about three weeks ago, has begun to transfer the plant to Milwaukee. The Beloit concern employed about 100 men, and its last year's business amounted to over $200,000. The Milwaukee concern's business is to be considerably enlarged the coming year.

Fires and Accidents:—

At Alexandria, Va., Dies' furniture factory burned with loss of $110,000; insurance, $35,000.

A boiler in Swift's rolling mills, Newport, Ky., exploded Dec. 13, killing two men and fatally wounding two others. Loss $15,000.

The Denver & Rio Grande railway's round house at Salida, Col., was burned with 17 engines and a quantity of machinery, Dec. 11. The loss is $400,000.

The electric light station of the General Electric Co., at Buffalo, burned. Most of the valuable machinery was ruined. The fire was caused by electricity. Loss, $50,000.

General Industrial Notes:—

There is figuring on a steel plant at Kenosha, Wis.

The Standard foundry, at St. Louis, recently burned, is being rebuilt.

It is probable that a steel casting plant will be erected at Depew, N. Y., in the spring.

The Edgar Thomson steel works, at Braddock, have closed for annual repairs, expecting to resume Jan. 1.

The New York Iron Co., of Minneapolis, has amended its articles of incorporation, increasing its capital stock to $250,000.

The rail mill of the Bethlehem Iron Co., which shut down last week has started again, and will run for a fortnight at least.

The Beaver Dam (Pa.) Malleable Iron Works foundry is completed and ready for operations, with orders on hand for a three months' run.

The St. Louis Railway Works & Foundry Co., of St. Louis, Mo., will vote, Feb. 11, on the proposition to increase its capital stock from $5,000 to $30,000.

The Benwood blast furnace, operated by the Wheeling Iron & Steel Co., and located at Martin's Ferry, O., after being under repair for several months, will soon be ready to blow in.

It is said that the Philadelphia & Reading Coal & Iron Co. is negotiating for the Minersville Iron Works, near Pottsville, Pa., and that the plant will start up again after being idle a year.

Massillon, O., expects to get the Wheeling & Lake Erie shops. Its board of trade will buy a farm adjoining the city, cut it into lots and sell them, using the $35,000 thus realized to secure the shops.

The New Pittsburg Coal Co., of Columbus, O., has contracted with the Jeffrey Mfg. Co., of the same place, for a second plant of its coal mining machines. The New Pittsburg Co.

THE KING BRIDGE COMPANY,

CLEVELAND, O.

Iron and Steel Bridges, Roofs, Girders, Buildings and Structural Work of all kinds, Hoisting and Conveying Machinery for Handling Ore, Coal, Etc.

has used the Jeffrey mining machines for over eight years, and the above order is for an electric plant.

Mr. Herbert C. Ayer has been appointed sales agent for the Calumet Iron & Steel Co., of Chicago, with office in the Monadnock Building. The Calumet Co. expect to be in shape to start up by the first of the year.

The strike of molders at the Iron City Foundry, Pittsburg, is ended. The molders in the green sand department quit because a number of men were discharged for neglecting work. Their places were filled with non-union men.

The contract for constructing an iron and steel bridge on Belle Isle Park, in Detroit river, has been awarded to the King Iron Bridge Co , of Cleveland, their proposal being the lowest of nine. The amount of their bid was $3,975.

At the Millvale Iron & Steel Co.'s works, which signed the scale after a long shut down, 29 puddling furnaces are in operation. Some of the old workmen are sore because Lawrenceville strikers rushed in at the first and got the best places.

Mr. R. D. Aitchison, of the Robt. Aitchison Perforated Metal Co., Chicago, has recently returned from a trip among the manufacturers of Ohio and Pennsylvania, and reports having secured a very large number of contracts. One of the largest closed was with the Aultman, Taylor Co., of Mansfield, for their yearly supply.

The Grenier Economical Cupola Co., Bort Building, Chicago, report the sale of several of their devices to steel plants in Pennsylvania, Ohio and Alabama, two or three of the orders being for complete equipment of the plants. Among the most recent contracts secured by them is one for two 78″ Grenier cupolas to go to the Solid Steel Co., at Alliance, O.

At Braddock, Pa., the wire works which are included in the new wire combine, have closed down until after the opening of the new year. Hereafter shipments will be made by river from Braddock to the St. Louis works of the company. A Bessemer steel plant, at Rankin, Pa., is said to be one of the new enterprises which the combine contemplates. Two or three blast furnaces are also part of the plan.

Spring Valley, Pierce Co., Wis., that was credited with 60 people a year ago is now reported to have several hundred inhabitants, and its blast furnace which the Eagle Iron Co. is building promises to make very cheap iron from the brown hematites that are available in the deposits near by. The blast furnace company has $150,000 capital paid in, and the Spring Valley Land Co., with $150,000 capital is reaching out for industries and people.

Warren, Webster & Co., 491 N. 3rd street, Philadelphia, patentees and manufacturers of the Webster vacuum feed water heater and purifier, and sole licensees for the sale of patent rights in the United States for the Williames vacuum sytem of steam heating, report 33 orders for the month of October, among whom are noted the Ohio Valley Fire Clay Co. Toronto, O.; Oswego Starch Co., Oswego, N. Y.; Jno. Francey's Sons & Co., Toronto, O.; Armour & Co., Chicago, Ill.; Geo. W. Tapley, Springfield, Mass.; American Iron & Steel Co., Pittsburg, Pa.; Merchants National Bank Building, Chicago, Ill.; Laidlaw & Dunn Co., Cincinnati, O.; Horlicks Food Co., Racine, Wis.; Western Coal Machinery Co., Denver, Col.; Niles Paper Co., Niles, Mich.; National Foundry & Pipe Works, Ltd., Scottdale, Pa.; Heath & Milligan Manufacturing Co., Chicago, Ill.; Boughen Engineering Co., Cincinnati, O.; Barnhart Brothers & Spindler, Chicago, Ill.; W. F. & F. C. Sayles, Saylesville, R. I.; Kilbourn Knitting Machine Co., Martinsburg, W. Va.; Merrick Thread Co., Holyoke, Mass.; Walter A. Wood Harvester Co., St. Paul, Minn.; D. Lowenburg, Norfolk, Va.; The Standard Union, Brooklyn, N. Y.; J. H. Sternburgh & Son, Reading, Pa.; Markle Fire Clay Co., Toronto, O.; Otis Falls Pulp Co., Livermore Falls, Me.; Landers, Frary & Clark, New Britain, Conn.: Frontenac Paper Co., Limerick, N. Y.; Nelson Morris & Co., Chicago, Ill.; Edward Joy, Syracuse, N. Y.; Thomson-Houston Co., Tremont, O.; National Wall Paper Co., Brooklyn, N. Y.; Sazen Worsted Co., Providence, R. I.; American Playing Card Co., Kalamazoo, Mich.; Work House, Cleveland, O. Warren Webster & Co., have just issued a new catalogue treating on the vacuum feed water heater and purifier, and visit plants

Holiday Excursions via Pennsylvania Lines.

On December 24th, 25th, 26th and 31st, 1892, and January 1st and 2d, 1893, excursion tickets at low round trip rates will be sold from stations on the Pennsylvania Lines West of Pittsburg to points on those lines in Western Pennsylvania, Ohio, Indiana, Illinois, Kentucky and West Virginia. Return coupons will be valid until January 3d. For details, please apply to nearest Pennsylvania Line ticket agent.

A Christmas Gift.

The Nickel Plate gives all an oppotunity to visit friends for almost nothing. Only one fare for the round trip. Tickets on sale December 23d to January 2d, good to return until January 5th.

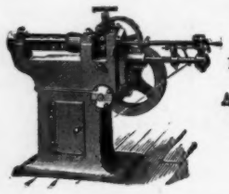
TAKE the Nickel Plate Holiday Excursions. One fare for the round trip between all points on the line. Longest limits. Call on Agents or address B. F. Horner, General Passenger Agent, Cleveland, O.

Holiday Excursions via the Nickle Plate.

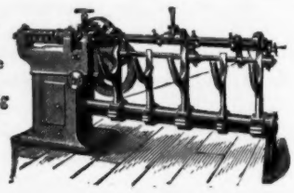
One fare for the round trip between all stations. Tickets on sale December 23d to January 2d, inclusive. Good returning until January 5th, 1893.

Valley Railroad.

On December 24th, 25th, 26th and 31st, '92, and January 1st and 2d, '93, will sell Holiday Excursion Tickets between all points on its lines at reduced rates. Good going on day of sale; good returning up to and including Jan. 3d, '93. For further information call on agents of Valley Ry., or address J. B. Caven, G. P. A.



JOHN ADT & SON,
New Haven, Conn.
Builders of Machinery for Hardware Manufacture.
Automatic Wire Straightening and Cutting Machines, Butt Milling Machinery, Butt Drilling Machinery, Riveting Machines, Foot Presses, Screw Cutters, Etc.



The Beckett
SMOKE CONSUMER.

Consumes the smoke, saves 20 to 25 per cent. in fuel, assists the draft, and increases the horse power of boilers.

It saves grate bars, prevents clinkers, and keeps the flues clean.

It will pay you to investigate our consumer.

THE BECKETT SMOKE CONSUMING CO.,
NORWALK, OHIO.

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125 Champlain, Cleveland, O.
Steel Name Stamps 1-16, 3-32 or ⅛ inch letters), 15c. per letter

ENGINES & BOILERS
Stationary & Semi-Portable.
8 to 25 HORSE-POWER.
High in Grade.
Low in Price.
Send for Pamphlet.
The W. C. LEFFEL CO.
Greenmount Ave., Springfield, O.

at their own expense. They announce that they furnish apparatus on trial.

Refined Iron for Puddling.

Mr. H. Le Neve Foster, Brierly Hill, Staffordshire, England, has recently invented and patented a process for the production of refined iron for puddling. He produces refined iron in a furnace having a basic or neutral lining, and prefers to use the regenerative furnace lined with shrunk dolomite, basic slag, or chrome iron ore, as by this means he can by melting a phosphoric and silicious pig, with or without a mixture of oxide of iron, obtain a refined metal, free or partly free from phosphorus and silicon, and suitable for puddling. The furnace preferred is constructed on the regenerative principle as above stated, but any form of furnace in which sufficient heat can be obtained could be used in all cases however, being lined with a basic or neutral lining which may be dolomite burnt in a kiln or cupola at a high temperature. On melting common iron containing a high percentage of both silicon and phosphorus, say, two per cent. to three per cent. silicon, and two per cent to 2½ per cent. phosphorus, in a furnace lined as described, with or without oxide of iron, a large proportion of both silicon and phosphorus can be eliminated and refined iron obtained having ¼ per cent. silicon and ½ per cent. phosphorus, or even less when required. Claims: In the manufacture of refined iron suitable for puddling, the use in a regenerative or other suitable furnace of a basic or neutral lining for the purpose of depriving of phosphorus and silicon, pig iron melted therein; for the purpose of depriving common pig iron of phosphorus and silicon, thereby fitting it for puddling purposes, the use and employment of shrunk dolomite as a lining for the regenerative or other furnace employed for this purpose.

WALTER B. PEARSON, George D. Phelps and L. B. Lungworthy have applied for the incorporation of a company to be known as the Pearson & Phelps Co., in Chicago. They have a machine shop at 20 W. Desplaines Street, Chicago, and are engaged in building iron working and special machinery.

EDITH furnace, of the Oliver Iron & Steel Co., Pittsburg, made 5,229 tons of No. 1 Bessemer iron in November.

FUEL ECONOMY.
SMOKE PREVENTION
IF YOU WANT TO KNOW ALL ABOUT THE VERY BEST FURNACE IN THE WORLD FOR ANY STEAM BOILER
Send for Illustrated Descriptive Pamphlet ON MECHANICAL STOKERS FREE
THE BRIGHTMAN STOKER CO.
CLEVELAND OHIO.

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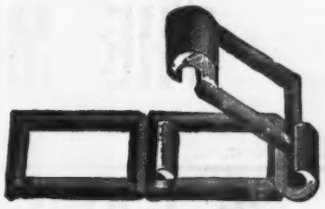
OPEN HEARTH AND CRUCIBLE
The Congdon Brake Shoe Co.
OFFICES AND FOUNDRIES: CHICAGO. ILL.
BRAKE SHOES

JEFFREY
Chain
Belting
—ALSO—
MALLEABLE, STEEL, WROUGHT AND SPECIAL CHAINS.



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ELEVATING AND CONVEYING MACHINERY.
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REDUCED PRICE LIST.
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143 E. First Ave., Columbus, O.
Chicago Branch, - - 48 So. Canal St.
New York Branch, 163 Washington St.

STEEL CASTINGS
FROM 1-4 TO 15,000 POUNDS WEIGHT.
True to patterns, sound, solid, free from blow-holes and of great strength.
Stronger and more durable than iron forgings in any position, or for any service whatever.
60,000 CRANK SHAFTS and 50,000 GEAR WHEELS of this steel, now running, prove this.
Crossheads, Rockers, Piston-Heads, etc., for Locomotives, STEEL CASTINGS of every description.
Send for circulars and prices to
CHESTER STEEL CASTINGS CO.,
WORKS: CHESTER, PA. OFFICE: 407 LIBERTY STREET, - PHILADELPHIA, PA.

Bischoff Metal Ceilings,
(PATENTED.)

It will pay to investigate and write for catalogue.
Estimates submitted on application.
Fred. F. Bischoff & Co.
24 W. Lake St.,
CHICAGO. - Ill.

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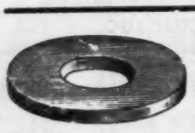

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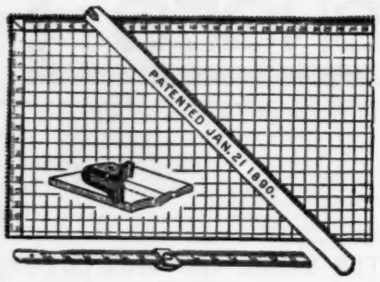

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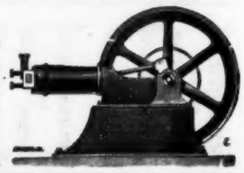

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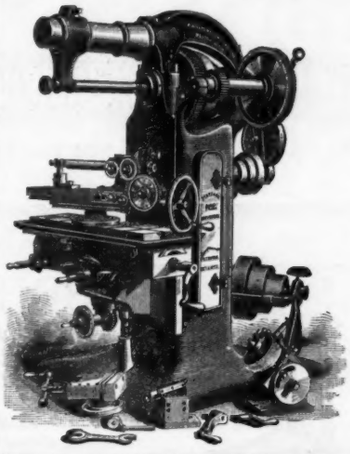

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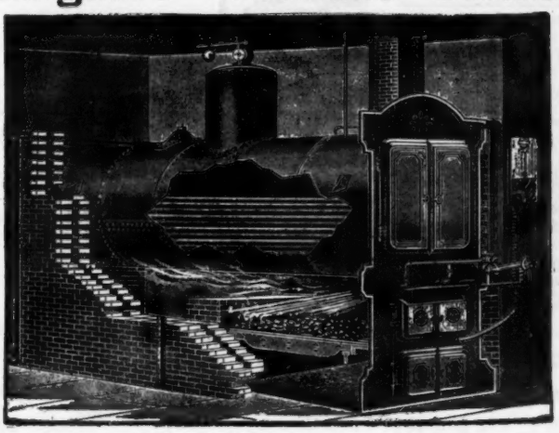

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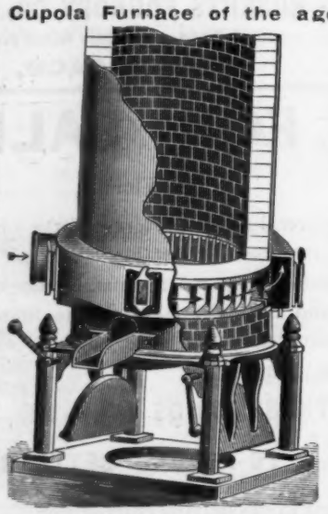

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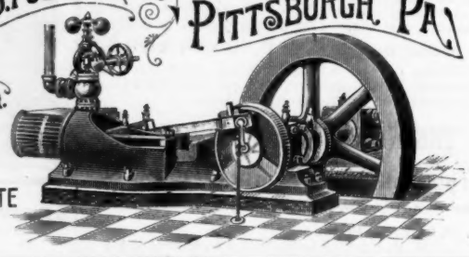

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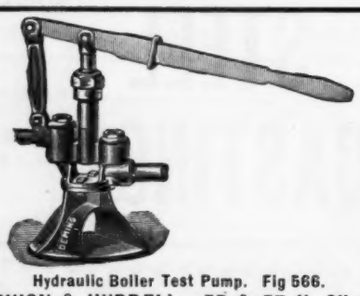

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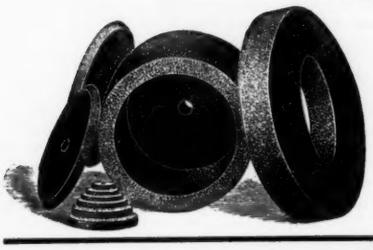

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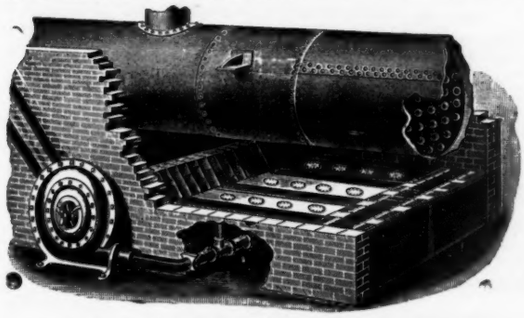

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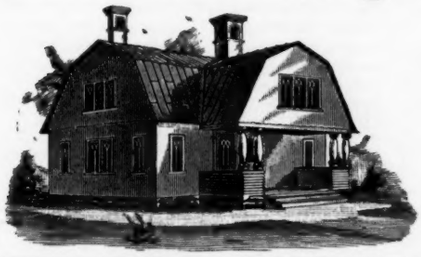

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J. Wendell Cole, M. E., Columbus, O., or Chicago, Ill.
Springfield Emery Wheel Co., Bridgeport, Ct.

Emery and Corundum Wheels—
Acme Safety Emery Wheel Co., Detroit, Mich.
J. Wendell Cole, Columbus and Chicago.
Thos. Buchanan & Co., Cincinnati, O.
Springfield Emery Wheel Co., Bridgeport, Ct.

Engines (Gas)—
Otto Gas Engine Co., Chicago, Ill.
Van Dusen Gas Engine Co., Cincinnati, O.

Ejectors—
James Jenks, Detroit, Mich.
American Injector Co.

Electro and Nickel Platers' Supplies—
Thos. Buchanan & Co., Cincinnati, O.

Engravers and Electrotypers—
Eclipse Electrotype & Engraving Co., Cleveland.
Union Electrotype Foundry, Cleveland.

Engines (Steam)—
Wm. Tod & Co., Youngstown, O.
E. H. Jones & Co., Cleveland.
Skinner Engine Co., Erie, Pa.
Lane & Bodley Co., Cincinnati, O.
L. Spence & Son, Martins Ferry, O.
Weston Engine Co., Painted Post, N. Y.
Brightman Stoker Co., Cleveland, O.
W. C. Leffel & Co., Springfield, O.
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.

Engineers and Contractors—
E. H. Jones & Co., Cleveland.
Thos. F. Bishop & Co., Cincinnati, O.
Brightman Stoker Co., Cleveland, O.
J. C. Slocum, Chicago, Ill.

Electrical Engineers—
L. K. Comstock, Chicago Ill

Engineers' Specialties—
James Jenks, Detroit, Mich.

Eave Troughs and Conductors—
Berger Mfg. Co., Canton, O.

Emery Grinding and Polishing Machines—
Thos. Buchanan & Co., Cincinnati, O.

Files, Makers of—
A. & H. Gough, Cleveland.
E. K. Morris & Co., Cincinnati, O.

Forges—
Cleveland City Forge & Iron Co., Cleveland.

Foundries—
Harn, Ow & Co., Beaver Falls, Pa.
Addyston Pipe & Steel Co., Cincinnati, O.
Radford Pipe and Foundry Co., Cincinnati, O.
Lane & Bodley Co., Cincinnati, O.
The Sam'l C. Tatum Co., Cincinnati, O.
J. W. Foley & Co., Cincinnati, O.
Brightman Stoker Co., Cleveland, O.
Congdon Brake Shoe Co., Chicago, Ill.
South Chicago Foundry Co., Chicago, Ill.
The Lloyd-Booth Co., Youngstown, O.
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.

Fire Brick and Clay—
J. Downerd & Son Co., Zanesville, O.
J. V. Rose, Sharon, Pa.
Stowe Fuller & Co., Cleveland.
J. J. Shepard, Cleveland,
Union Mining Co., Mt. Savage, Md.
Garden City Sand Co., Chicago, Ill.

Foundry Supplies—
J. Downerd & Co., Zanesville, O.
J. D. Smith Fdy. Supply Co., Cincinnati, O.
Straub Machinery Co., Cincinnati, O.
Garden City Sand Co., Chicago, Ill.

Facings & Blackings—
J. D. Smith Fdy. Supply Co., Cincinnati, O.

Flour Mill Machinery—
The Bradford Mill Co., Cincinnati, O.

Furnace Linings—
Union Mining Co., Mt. Savage, Md.

Foot and Power Lathes—
H. L. Shepard, Cincinnati, O.
Sidney Machine Co., Sidney, O.

For Sale—
Walburn-Swenson Mfg. Co., Fort Scott, Kan.

Fans—
B. F. Sturtevant Co., Boston, Mass.

Friction Clutch Pulleys—
J. H. & D. Lake Co., Hornellsville, N. Y.

Flue Cleaners—
E. Rayfield, Chicago, Ill.

Furnace Grates—
Gordon Hollow Blast Grate Co., Greenville, Mich.

Fuel Oil Burners—
Gilbert & Barker Mfg. Co., Springfield, Mass.
Kenderdine Hydro Carbon Fuel Co., Frankford, Philadelphia, Pa.
C. D. Juvinall & Co., Upper Sandusky, O.

Gear Cutters—
Palmer, Cunningham & Co., Philadelphia, Pa.

Galvanizers—
H. H. Hodell, Cleveland.

Grindstones—
E. K. Morris & Co., Cincinnati, O.

Glass Boards—
Canton Saw Co., Canton, O.

Gearing
Straub Machinery Co., Cincinnati, O.

Graphite Paint—
Jos. Dixon Crucible Co., Jersey City, N. J.
W. W. Lawrence & Co., Pittsburgh, Pa.

Heaters and Purifiers—
Stilwell & Bierce Manufacturing Co., Dayton, O
E. H. Jones & Co., Cleveland.
Thos. F. Bishop & Co., Cincinnati, O.
Warren Webster & Co., Philadelphia, Pa
Brightman Stoker Co., Cleveland, O.

Grate Bars—
Gordon Hollow Blast Grate Co., Greenville, Mich.

Hack Saws—
Millers Falls Co., New York City.

Hardware Specialties—
The Sam'l C. Tatum Co., Cincinnati, O.

Heavy Hardware—
E. K. Morris & Co., Cincinnati, O.

Higgs & Seaman's Gas Valves—
Totten & Hogg Iron and Steel Foundry Co., Pittsburgh, Pa.

Hangers, Pulleys and Shafting—
Lane & Bodley Co., Cincinnati, O.
The Sam'l C. Tatum Co., Cincinnati, O.
J. W. Foley & Co., Cincinnati, O.

Hoisting and Conveying Machinery—
The King Bridge Co., Cleveland, O.

Heating and Ventilating Fans—
B. F. Sturtevant Co., Boston, Mass.

Hydro-Carbon Burners—
Kenderdine Hydro-Carbon Fuel Co., Philadelphia, Pa.
C. D. Juvinall & Co., Upper Sandusky, O.

Iron Filler—
W. W. Lawrence & Co., Pittsburgh, Pa.

Iron Nails and Steel—
Weber & Co., Cincinnati, O.

Iron Ore, Bar and Pig Iron—
Oglebay, Norton & Co., Cleveland.
J. H. Outhwaite & Co., Cleveland.
Condit-Fuller Co., Cleveland.
E. C. Pope, Cleveland.
Cleveland Iron Mining Co., Cleveland.
Corrigan, Ives & Co., Cleveland.
Aetna Iron & Steel Co., Bridgeport, O.
B. M. Jones & Co., Boston and New York.
Wilhelm & Co., Harrisburg, Pa.

Iron Rolls and Pinions.
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.

Injectors—
Penberthy Injector Co. Detroit Mich.
Eagle Lubricator Co., Cleveland, O.
American Injector Co.

Iron and Steel Roofing—
Sykes Iron & Steel Roofing Co., Niles, O.
Berger Mfg. Co., Canton, O.
Porter Iron Roofing & Corrugating Co., Cincinnati, O.

Investments—
Frank R. Biedler, Baltimore, Md.
Fidelity & Deposit Co., Baltimore, Md.
Duluth Mining Investment Co., Duluth, Minn.
Geo. Pemberton, New York.

Insurance Companies—
Hartford Steam Boiler I. & I. Co., Hartford, Ct

Improvement Companies—
Muncie Land Co , Muncie, Ind.

Iron Buildings—
The King Bridge Co., Cleveland, O.

Lathes—
Sidney Machine Co., Sidney, O.
H. L. Shepard, Cincinnati, O.
Aurora Tool Works, Aurora, Ind.
The Bradford Mill Co., Cincinnati, O.
Hill, Clarke & Co., Chicago, Ill.

Lathe Dogs—
Palmer, Cunningham & Co., Philadelphia

Lathe Tools—
Armstrong Bros. Tool Co., Chicago, Ill.

Link Belting—
The Jeffrey Mfg. Co., Columbus, O.

Lifting & Mixing Machinery—
J. H. Day & Co., Cincinnati, O.

Land Companies—
Muncie Land Co., Muncie, Ind.

Lanterns—
Rau Manufacturing Co., Chicago, Ill.

Lubricators—
Eagle Lubricator Co., Cleveland, O.

Mining Machinery—
Copeland & Bacon, New York.

Machine Shops—
Toledo Machine & Tool Co., Toledo, O.
Spicer Mfg. Co., New Philadelphia, O.
Harn, Ow & Co., Beaver Falls, Pa.
Thos. F. Bishop & Co., Cincinnati, O.
Godfrey J. Bremer, Kalamazoo, Mich.

Machinists' Tools and Supplies—
Garvin Machine Co., New York.
Aurora Tool Works, Aurora, Ind.
Cincinnati Milling Machine Co., Cincinnati, O.
Godfrey J. Bremer, Kalamazoo, Mich.
Hill, Clarke & Co., Chicago, Ill.
Callender & Patterson, Dayton, O.

Metal Ceilings—
Fred F. Bischoff, Chicago, Ill.

Municipal Bonds—
Frank R. Biedler, Baltimore, Md.

Milling Machines—
Cincinnati Milling Machine Co., Cincinnati.
Godfrey J. Bremer, Kalamazoo, Mich.
Brainard Milling Machine Co., Hyde Park, Mass.
Hill, Clarke & Co., Chicago, Ill.

Moulding Sand—
Garden City Sand Co., Chicago, Ill.
J. Downerd & Son Co., Zanesville, O.

Mill Machinery—
Straub Machinery Co., Cincinnati, O.

Mines and Mining Stock—
Frank R. Biedler, Baltimore, Md.

Mining Engineers—
A. Leofred, Quebec, Can.

Mechanical Engineers—
J. C. Slocum, Chicago, Ill.

Oilers—
Rau Manufacturing Co., Chicago, Ill.

Oil Burners—
Kenderdine Hydro-Carbon Fuel Co., Philadelphia, Pa.
C. D. Juvinall & Co., Upper Sandusky, O.

Oil Well Machinery—
The Golley & Finley Iron Works, Lima, O.

Oil Tanks—
Aultman, Taylor Mfg. Co., Mansfield, O.

Ore Crushers—
Bradley Fertilizer Co., Boston, Mass.
Totten & Hogg Iron and Steel Foundry Co., Pittsburgh, Pa.

Pumps (Steam)—
E. H. Jones & Co., Cleveland.
Deming Co., Salem, O.
Thos. F. Bishop & Co., Cincinnati, O.
Brightman Stoker Co., Cleveland, O.

Paint—
Iron Clad Paint Co., Cleveland.
W. W. Lawrence & Co., Pittsburg, Pa.
Jos. Dixon Crucible Co., Jersey City, N. J.

Perforated Sheet Metal—
Harrington & King Perforating Co., Chicago, Ill.
Aitchison Perforated Metal Co., Chicago.

Photo-Engravers—
National Photo-Engraving Co., Cleveland.

Powder—
Hercules Powder Co., Cleveland.

Presses—
Toledo Machine and Tool Co., Toledo, O.
Godfrey J. Bremer, Kalamazoo, Mich.

Plumbago—
J. D. Smith Fdy. Supply Co., Cincinnati, O.

Pulleys—
Straub Machinery Co., Cincinnati, O.
Lane & Bodley Co., Cincinnati, O.
J. W. Foley & Co., Cincinnati, O.

Power Plants—
Weston Engine Co., Painted Post, N. Y.

Portable Hoists—
James Dunn, Cleveland, O.

Portable Forges—
B. F. Sturtevant Co., Boston, Mass.

Plates—
Aetna Iron & Steel Co., Bridgeport, O.

Pulverizing Machinery—
Bradley Fertilizer Co., Boston, Mass.

Railway Supplies—
Cleveland City Forge & Iron Co., Cleveland.

Radial Drills—
Universal Radial Drill Co., Cincinnati, O.

Rock Breakers—
Totten & Hogg Iron and Steel Foundry Co., Pittsburgh, Pa.
Bradley Fertilizer Co., Boston, Mass.

Rolling Mill Machinery—
The Lloyd-Booth Co., Youngstown, O.
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.

Roll Lathes—
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.

Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.

Saws—
Peter Gerlach & Co., Cleveland.
Canton Saw Co., Canton, O.

Steel Rails, Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland.

Smokeless Furnaces—
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Brightman Stoker Co., Cleveland, O.

Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland.
F. A. Sackman, Cleveland, O.

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Cleveland Rolling Mill Co., Cleveland.
The Golley & Finley Iron Works, Lima, O.
Aetna Iron & Steel Co., Bridgeport, O.

Sheet Steel—
Aetna Iron & Steel Co., Bridgeport, O.

Semi-Steel—
South Chicago Foundry Co., Chicago, Ill.
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.

Steel Castings—
Chester Steel Casting Co., Philadelphia, Pa.
New Castle Steel Casting Co., New Castle, Pa.
Congdon Brake Shoe Co., Chicago, Ill.
South Chicago Foundry Co., Chicago, Ill.
Totten & Hogg Iron and Steel Foundry Co, Pittsburgh, Pa.
F. E. Roberts Foundry Co., Chicago, Ill.

Steel Color Paint—
W. W. Lawrence & Co., Pittsburgh, Pa.

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Klein & Cohn, Cincinnati, O.

Special Machinery—
Toledo Machine & Tool Co., Toledo, O.
J. H. Day & Co., Cincinnati, O.
Godfrey J. Bremer, Kalamazoo, Mich.

Shafting—
Straub Machinery Co., Cincinnati, O.

Stokers—
Brightman Stoker Co., Cleveland, O.

Steel Rails, Blooms and Billets—
Aetna Iron & Steel Co., Bridgeport, O.

Structural Work—
The King Bridge Co., Cleveland, O.

Sand and Chill Rolls—
The Lloyd-Booth Co., Youngstown, O.

Smoke Consumer—
The Breckett Smoke Consuming Co., Norwalk, O.
Jas. Sargent, Rochester, N. Y.
Northwestern Land & Coal Co., Boston, Mass.
Jas. V. Burke, Chicago, Ill.
Brightman Stoker Co., Cleveland, O.

Steel Mushet's—
B. M. Jones & Co., Boston and New York.

Stay Bolt Iron—Taylor's—
B. M. Jones & Co., Boston and New York.

Twist Drills—
Cleveland Twist Drill Co., Cleveland.
Graham Twist Drill & Chuck Co., Detroit, Mich.
The Whitman & Barnes Mfg. Co., Akron, O.

Torches—
Rau Manufacturing Co., Chicago, Ill.

Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland.

Tanks—
The Golley & Finley Iron Works, Lima, O.

Tin Plates (Roofing)—
Merchant & Co., Philadelphia, Pa.

Tinning Machinery—
The Lloyd-Booth Co., Youngstown, O.

Trucks—
The Spicer Mfg. Co., New Philadelphia, O.

Turret Drills—
A. P. Quint, Hartford, Conn.

Ventilating Fans—
E. H. Jones & Co., Cleveland.
Brightman Stoker Co., Cleveland, O.
B. F. Sturtevant Co., Boston, Mass.

Watchman's Time Detector.
Cleveland Electrical Mfg. Co., Cleveland, O.
A. Nanz & Co., New York City.

Wood-Working Machinery—
The Egan Co., Cincinnati, O.

Wire Machinery—
John Adt & Son, New Haven, Conn.

Washers—
Milton Mfg. Co., Milton, Pa.

Water, Gas and Steam Pipe—
Addyston Pipe & Steel Co., Cincinnati, O.
Radford Pipe & Foundry Co., Cincinnati, O.

Wheelbarrows—
Akron Tool Co., Akron, O.

Water Stand Pipes—
Aultman, Taylor Mfg. Co., Mansfield, O.

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The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

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IRON AND STEEL MARKETS.

IRON ORE.

Extra Low Phosphorus Bessemer	$ 5.50
No. 1 Specular, Bessemer quality	$5.00@$5.25
No. 1 Bessemer hematite	$4.25
Minnesota Bessemer hematite	$ 4.50
Hematites No. 1 non-Bessemer	$3.25@$ 3.50
No 1. Specular, Non-Bessemer	$3.50@$4.00

PIG IRON.

CLEVELAND (f. o. b. cars):

Bessemer	$13 85@$14 00
No. 1 Strong Foundry	14 50@ 00 00
No. 2 Strong Foundry	13 50@ 13 75
No. 1 Grey Forge, red short	13 00@ 00 00
No. 2 Gray Forge, neutral	12 50@ 13 00
No. 1 American Scotch	14 50@ 14 75
No. 2 American Scotch	13 50@ 13 75
Lake Superior Charcoal	17 00

PITTSBURGH (reported by A. H. Childs):

No. 1 Foundry	$14 50@$14 75
No. 2 Foundry	13 50@ 13 75
Grey Forge	12 50@ 00 00
White and Mottled	12 00@ 12 25
Warm Blast Charcoal	18 00@ 22 00
Cold Blast Charcoal	22 00@ 27 00
Bessemer	13 80@ 14 00

CHICAGO (reported by our representative:)

Lake Superior Charcoal	$17 00@$17 50
Local Coke Foundry No. 1	14 50@ 14 75
Local Coke Foundry No. 2	13 50@ 14 00
Local Coke Foundry No. 3	13 25@ 13 75
Local Scotch Foundry No. 1	15 00@ 16 00
Local Scotch Foundry No. 2	14 00@ 14 50
Local Scotch Foundry No. 3	13 50@ 14 00
Southern Coke No. 1	14 85@ 15 25
Southern Coke No. 2	13 85@ 14 00
Southern Coke No. 3	13 35@ 13 60
Southern No. 1 Soft	13 85@ 14 25
Southern No. 2 Soft	13 35@ 13 75
Ohio Silveries No. 1	17 00@ 17 50
Ohio Silveries No. 2	16 00@ 16 50
Ohio Strong Softeners No. 1	16 50@ 17 00
Ohio Strong Softeners No. 2	15 50@ 16 00
Tennessee Charcoal	16 50@ 17 00
Alabama Car Wheel	19 85@ 21 00

CINCINNATI (reported by Hyatt, Mathews & Co.):

Southern Coke No. 1, Foundry	$14 00@$14 25
Southern Coke No. 2 and No. 1 Soft	13 00@ 13 25
Southern Coke No. 3	12 50@ 12 75
Ohio Soft Stone Coal No. 1	16 00@ 16 50
Mahoning Valley No. 1	16 50@ 16 75
Mahoning Valley No. 2	15 50@ 15 75
Hanging Rock Charcoal No. 1, Fdy	19 00@ 19 50
Hanging Rock Charcoal No. 2, Fdy	18 00@ 18 50
Alabama Charcoal No. 1	16 00@ 16 50
Standard Southern Coke, Grey Forge	11 75@ 12 00
Mottled Neutral Coke	11 50@ 11 75
High Grade Virginia Coke Iron No. 1	16 25@ 16 50
High Grade Virginia Coke Iron No. 2	15 25@ 15 50
Southern Car Wheel Iron	18 00@ 18 75
Lake Superior Car Wheel & Malleable	18 00@ 18 50

BUFFALO (reported by Rogers, Brown & Co.)

Mahoning and Shenango Valley, strong, No. 1 Foundry	$15 25
Mahoning and Shenango Valley, strong, No. 2 Foundry	14 25
Ohio Softener No. 1	15 25
Ohio Softener No. 2	14 25
Jackson Co. Silvery, No. 1	17 30
Jackson Co. Silvery, No. 2	16 80
Lake Superior Charcoal	17 00
Tennessee Charcoal	18 00
Southern Softener No. 1	14 40
Alabama Car Wheel	19 00
Hanging Rock Charcoal	20 50

LOUISVILLE (reported by Geo. H. Hull & Co.)

Southern Coke No. 1 Foundry	$13 25@$13 50
Southern Coke No. 2 Foundry	12 00@ 12 25
Southern Coke No. 3 Foundry	11 50@ 11 75
Grey Forge	11 25@ 11 50
Southern Charcoal No. 1 Foundry	15 00@ 16 00
Car Wheel	17 50@ 17 75

LOUISVILLE (reported by Hall Bros. & Co.):

Southern Coke No. 1	$13 50@$13 75
Southern Coke No. 2	12 50@ 12 75
Southern Coke No. 3	12 00@ 12 25
Southern Charcoal No. 1	16 00@ 17 00
Southern Charcoal No. 2	15 50@ 16 00
Missouri Charcoal No. 1	17 00@ 17 50
Missouri Charcoal No. 2	16 50@ 17 00
Neutral Coke	11 50@ 12 00
Cold Short	11 25@ 11 50
Mottled	11 00@ 11 25
Southern (standard brands)	20 00@ 21 00
Southern (other brands)	18 50@ 19 50
Lake Superior	19 50@ 20 50

ST. LOUIS (reported by Rogers, Brown & Meacham):

Southern Coke No 1	$14 50@$14 75
Southern Coke No. 2	13 25@ 13 50
Southern Coke No. 3	12 75@ 13 00
Southern Grey Forge	12 25@ 12 50
Southern Charcoal No. 1	16 00@ 16 50
Southern Charcoal No. 2	15 00@ 15 50

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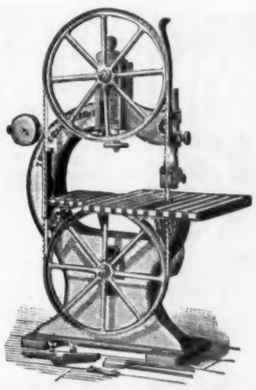

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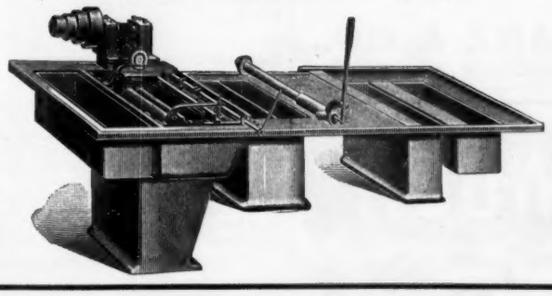
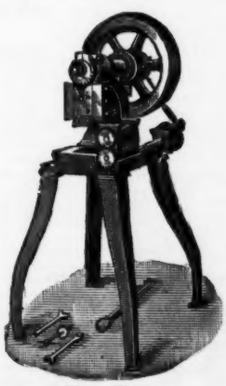


Rolling Mills, Sand and Chill ROLLS.



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Lake Superior	18 00@ 18 25
Southern	18 50@ 18 75
Connellsville Coke, St. Louis	5 65

DETROIT (reported by William F. Jarvis & Co.:)

Lake Superior Charcoal, all numbers	$17 00@$17 50
Lake Superior (coke) Bessemer	16 00@ 16 50
Lake Superior Coke, Foundry, all ore	16 00@ 17 00
Standard Ohio Black Band	16 50@ 17 00
Southern No. 1	14 50@ 15 00
Southern Grey Forge	12 50@ 13 00
Jackson County (Ohio) Silvery	17 75@ 18 25

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	Gross Tons
Old iron rails	$18 50
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No. 1 R. R. wrought scrap	$15 50
No. 1 wrought scrap	14 00
No. 1 Machine cast scrap	10 00
Iron axles	20 00
Axle turnings	11 00
Wrought turnings (free from cast)	8 50
Cast borings	6 50
Uncut wrought iron boilers	9 00
Steel boiler Plates	13 00
Grate bars	6 50
Pipes and flues (clean)	9 50
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Hoop and band iron	8 00
Sheet iron	7 00
Wrought drillings	8 00
Malleable iron	9 00

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Beams and Channels (f. o. b. mill)	2.10c@2.25c
Angles	1.85c@1.90c
Tees	2.50c
Universal Plates	1.85c
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Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 65
4¼ to 6 by ⅜ to 1 inch	1 70
1¾ to 6 by 1⅛ to 2 inch	1 85
1¾ & 1⅜ by ⅜ to ¾ inch	1 70
1 & 1⅛ by ⅜ to ¾ inch	1 75
⅝, ⅞, ⅞, by ⅜ to ⅝ inch	1 85

Round and Square.

1 to 1⅞ inch	1 65
2 to 2⅝ inch	1 75
2¾ to 3¼ inch	1 90
3⅜ to 4 inch	2 15
4¼ to 4½ inch	2 75
4¾ to 5 inch	3 00

Oval.

⅞ to 1¼ inch	1 85
⅝ to ¾ inch	1 85
½	2 05
⅜	2 25

Half Oval and Half Round.

1½ to 3 inch	2 20
⅞ to 1½ inch	2 00
⅝ to ¾ inch	2 25
½	2 40
⅜	3 50

Heavy Band.

1¾ to 6 by ¼ and 5-16 inch	1 75
1 to 1⅜ by ¼ and 5-16 inch	1 80
¾ to ⅞ by ¼ and 5-16 inch	1 90
½ to ⅝ by ¼ and 5-16 inch	2 15

Hoops.

1¾ to 4, Nos. 13 to 15	2 40
1¼ to 2, Nos. 16 to 18	2 45
1¼ to 2, No. 19	2 50
1¼ to 2, No. 20	2 50
1¼ to 2, No. 21	2 60
1¼ to 2, No. 22	2 70
15-16, 1 and 1⅛, Nos. 13 to 15	2 45
15-16, 1 and 1⅛, Nos. 16 to 18	2 50
15-16, 1 and 1⅛, Nos. 19 and 20	2 60
15-16, 1 and 1⅛, No. 21	2 70
15-16, 1 and 1⅛, No. 22	2 80
⅞, Nos. 13 to 15	2 60
⅞, Nos. 16 to 18	2 70
⅞, Nos. 19 and 20	2 80
⅞, No. 21	2 90
⅞, No. 22	3 00
13-16, Nos. 13 to 15	2 70
13-16, Nos. 16 to 18	2 80
13-16, Nos. 19 and 20	2 90
13-16 No. 21	3 00
13-16, No. 22	3 10
¾, Nos. 13 to 15	2 80
¾, Nos. 16 to 18	2 95
¾, Nos. 19 and 20	3 05
¾, No. 21	3 15
¾, No. 22	3 25
11-16, Nos. 13 to 15	3 05
11-16, Nos 16 to 18	3 10
11-16, Nos. 19 and 22	3 20
11-16, No. 21	3 30
11-16, No. 22	3 40
⅝, Nos. 13 to 15	3 10
⅝, Nos. 16 to 18	3 20
⅝, Nos. 19 and 20	3 30
⅝, No. 21	3 40
⅝, No. 22	3 50
⅝, No. 23	3 60

Light Band.

1½ to 6 by ⅛ to 3-16 inch	1 95
1½ to 6 by Nos. 11 and 12	2 00
1 to 1⅜ by ⅛ to 3-16 inch	2 00
1 to 1⅜ by Nos. 11 and 12	2 05
⅞ and 13-16 by ⅛ to 3-16 inch	2 15
⅞ and 13-16 by Nos. 11 and 12	2 20

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THE GREAT STUMP AND ROCK
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¾ and 11-16 by ⅛ to 3-16 inch	2 25
¾ and 11-16 by Nos. 11 and 12	2 30
⅝ and 9-16 by ⅛ to 3-16 inch	2 40
⅝ and 9-16 by Nos. 11 and 12	2 45
½ by ⅛ to 3-16 inch	2 55
½ by Nos. 11 and 12	2 60

Wagon Box Iron.

⅞ inch, beveled edge, by Nos. 11 and 12	2 20
⅞ inch, " " " " 13 and 14	2 30
¾ inch, " " " " 11 and 12	2 35
¾ inch, " " " " 13 and 14	2 55

Sheet Iron.

No. 10 to 14	2 30
No. 15 to 17	2 45
No. 18 to 21	2 60
No. 22 to 24	2 70
No. 25 to 26	2 80
No. 27	2 90
No. 28	3 55

Iron Boiler Plates.

Tank, ¼ inch and heavier	2 25
C No. 1, " "	2 40
C H No. 1, " "	2 50
C H Flange, " "	3 50
Extra Flange "	4 00
Solid Fire Box "	4 75

Steel Boiler Plates—1-4 in. and Heavier.

Tank	2 25
Shell	2 50
Flange	2 75
Marine Flange	3 00
Fire Box	400
Above includes plates 90 inches wide.	
90 to 96 in. wide	½c. lb. extra
96 to 100 in. wide	1 c. "
100 to 104 in. wide	1½c. "
104 to 116 in. wide,	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. lbs.
1 to 2 in, inclusive	08
9-16 to ½ in. "	08½
7-16 to ⅜ and 2⅜ to 3 in	09
3⅛ to 4 in	09½
⅜ to 11-16 and 4½	10
⅛ to 6 in	10½
¼ to 9-32 and 6¼ to 7 in	11
3-16 in	13

Flats.

	cts. lbs.
2 to 9-16 in. wide by 2 to ⅝ thick	8

Bessemer and O. H. Steel.

Machinery	base price, 2 35
Tire	" 2 25
Spring	" 2 80
Sleigh Shoe	" 2 50
Toe Calk	" 2 35
Cutter Shoes, tapered and bent	" 2 75

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	4 00
Bridge ½, ⅝, 11-16 and ¾ inch diam	4 00

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American	℔ 9@10
Wright's	℔ 12

Bellows.

Blacksmiths'	Hill's dis 40
	Bullock's dis 50&10
Moulders'	dis 40@40&10
Hand	dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 70
" " " extra	dis 60&5
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 45
Shultz Raw Hide Leather Belting, single	dis 40
Munson's Short Lap Single Leather	dis 45
Munson's Short Lap Double and Light Double Leather	dis 50
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis 45

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.,	dis 35
Buffalo	dis 40

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 30
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis 30
Horton's Universal	dis 40
" Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 40
Sweetland "	dis 40
Almond Drill	dis 20
Morse "	dis 15
Skinner's Combination Lathe	dis 40&10
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 35

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15

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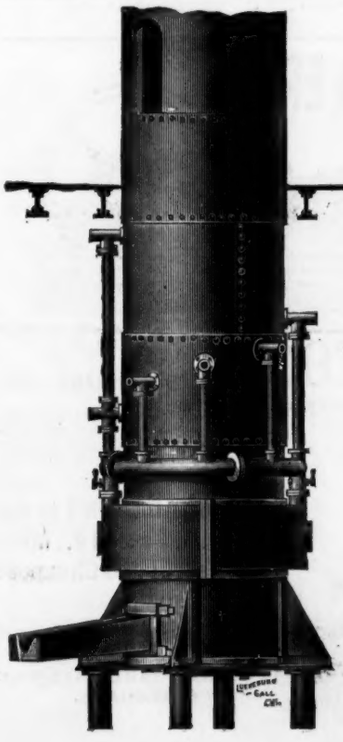

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" " Gear Cutters.....dis 15

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Cast Steel.....₩ lb 3½
Iron, steel points.....₩ lb 3½

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Twist Drills.....dis 50&10
Morse Taper and Straight Shank to 1½".dis 50&10
Morse Taper and Straight Shank Larger than 1½".....dis 25
Drill Sockets.....dis 25
Standard Twist Drills.....dis 55@55&5
Cleveland " " .....dis 55@55&5

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	No. 4 to 46 gr.	No. 54 to 150 gr.	Flour, C. F. F. FF.
Kegs, ₩ lb	4½c	5 c	2½c
½ kegs ₩ lb	4¾c	5¼c	2¾c
¼ kegs ₩ lb	5 c	5½c	3 c
10 lb cans, 10 in case	6 c	6½c	5 c
10 lb cans, less than 10	10 c	10 c	7½c

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Grant.....dis 55@60
Sterling.....dis 60
Celluloid.....dis 10&33⅓
Northampton.....dis 55
Crystal.....dis 65@70
Vitrified.....dis 60
Vulcanite.....dis 60&10
Hamden.....dis 60&10
Cyclone.....dis 60

Files.

Arcade.....dis 60&10@60&10&10
Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
McClellan.....dis 60&10@60&10&10
Disston's.....dis 65@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50
Industry File Works, Hand Cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs.....15c
" " " " over 5 lbs.....12c

Jack Screws.

Illinois Bolt Co. list.....dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¼	4	3¾	3½
Hexagon	15½	11½	8½	6	5¾	5¼	5
Washers	9	8	7	5	4½	4½	4½

In lots less than 100 lbs, ₩ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

List July 14, 1887.....dis 75
Standard Penny Nails, ₩ keg card rate
Car lots.....$1.60
Less than car lots...$1.70

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 10@10&10

Packing, Steam.

Boston Belting Co.....dis 60
American Packing Hemp.....₩ lb 9@10
Russia " " .....₩ lb 14
Italian " " .....₩ lb 13@19
Plumbago Piston.....₩ lb 40
Peerless.....₩ lb 60
Morrison's " .....₩ lb 50
Square Flax " .....₩ lb 50
Sheet Rubber.....₩ lb 12&24
Excelsior Rubber.....₩ lb 48
Rainbow.....Full Rolls.....50c ₩ lb; Less than Full Rolls. 60c ₩ lb
Eclipse Gasket.....₩ lb 75

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Pulleys.

Iron Pulleys, Walker List.....dis 40
Medart Pulleys.....dis 50
Split Wood Pulleys.....dis 50@55

Rivets.

Iron, Thousand, list November 17.....dis 50@50&10
Iron, Ordinary, Cooper's Block and Carriage list November 17.....dis 50@50&10
Copper.....dis 50@50&10

Saws.

Disston's Circular.....dis 40&10
" Band.....dis 25
" Scroll.....Net
Hack Saw Stubs.....dis 20
" " Eureka.....dis 20
" " Star.....dis 20
Saw Swages Diston's.....dis 30
Atkins' Circular Saws.....dis 40&45
" Mill, Mulay and Drag Saws.....dis 40&10
" Wood Saws.....dis 40&10
" Silver Steel Diamond Cross-cut Saws.....70c per ft
" Dexter Cross-cuts.....50c "
" Diamond " .....30c "
" Tuttle Tooth Cross-cuts.....25c "
" One-man Cross-cuts.....32c "

No. 1 Handles	23c per pair
No. 6 "	16c "
Excelsior Saw Tools	$6 per doz
Perfection "	$15 "
Detroit Saw Works, Circular	dis 50
" " " Band	dis 25
" " " Mulay	dis 45

Taps.

Cards, Hand and Nut to 2 in	dis 50
Carpenters' " " "	dis 50
Morse " " "	dis 50
Pratt & Whitney " " new list	dis 10
Machine Screw Taps	dis 55
Pipe Taps to 2½ in	dis 70
Stay Bolt Taps	dis 25
Stove Bolt Taps	dis 55
Pulley Taps	dis 40

Vises.

Solid Box	dis 60
Parker's	dis 20@25
Prentiss	dis 20
Stephen's	dis 25@30
Barrett's	dis 30
Miller's Falls	dis 40
Merrill's	dis 15@20
Howard	dis 35

Wire.

New List, Jan. 18, 1884

Brass	dis 30
Copper	dis 40
Bright and annealed, Nos. 0@18	dis 70&10@75
" " Nos. 19@26	dis 75@75& 5
" " Nos. 27@36	dis 75&10& 5
Coppered Nos. 0 to 18, market list	dis 70@70& 5
Galvanized Nos. 0 to 18 " "	dis65& 5
Tinned market Nos. 0 to 18	dis 67½
Cast steel	dis 50
Tinned Broom Wire	dis 70&5@70&10
Annealed Fence, Nos. 8 and 9	dis 75
Annealed Grape, Nos. 10 to 14	dis 75
Stub's Steel Wire regular	95c ℔ lb dis 30

Wrenches.

Coe's genuine	dis 50
Girard Standard	dis 70&10
Agricultural	dis 75&10
Mechanic's	dis 55&10& 5
Bemis & Call's Combination	dis 35
Donohue's Engineers	dis 20&10
Lamson & Sessions Engineers	dis 60
Billings & Spencer's Drop Forged	dis 25
William's " "	dis 25
Alligator " "	dis 40

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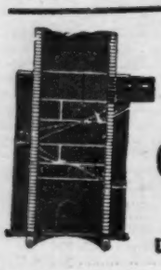

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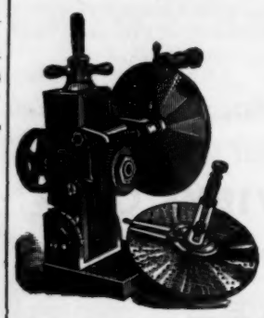

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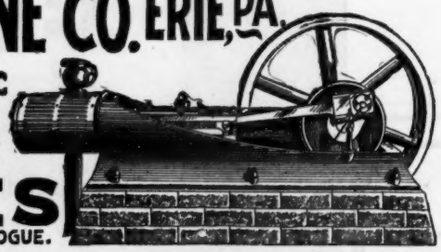

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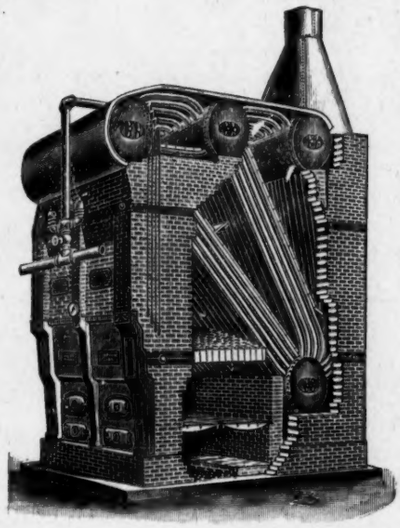

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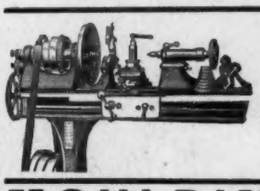

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